MARCH 1983

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TODAY

THE VIDEOTEX/COMPUTER MAGAZINE

SPECIAL COMPUTER GRAPHICS INSERT

Computers in Education

Micro Miracles for the Handicapped

French 3-V Videotex Experiment

Today Goes Monthly

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TODAY
THE VIDEOTEX/COMPUTER MAGAZINE

SPECIAL REPORT

MICRO MIRACLES FOR THE HANDICAPPED

9 **Window on the World**
With innovative and increasingly affordable sensory aid devices coming on the market, blind and visually-impaired people are able to read a newspaper, look up something in the encyclopedia, communicate and even work at a challenging job—all with the aid of a computer.

13 **Breaking the Sound Barrier for the Hearing Impaired**
Computer-assisted instruction offers tremendous potential for helping the deaf and hearing-impaired overcome the problems of acquiring and disseminating information. Using microcomputers as educational tools, teachers and researchers have taken an important step in giving the deaf a way to break the silence barrier.

EDUCATION

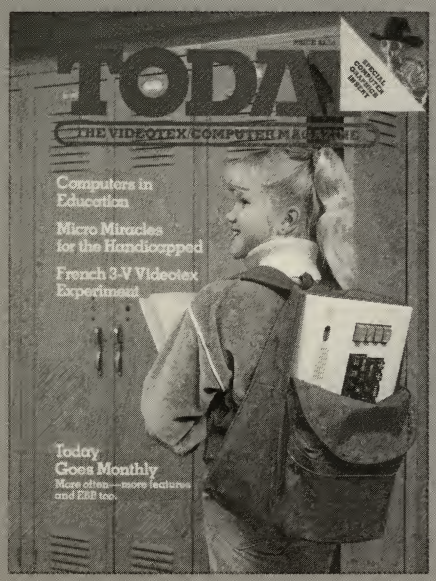
16 **Educational Computing: There's a Lot to Learn**
Computer education has taken America by storm. But are the nation's educators making the most of microcomputing, or are teachers little more prepared than the students they are instructing? What do the students think about computer-assisted education? Find some surprising answers in this five part report by TODAY writer Carole Houze Gerber.

INTERVIEW

23 **Kolomyjec: An Artist Talks About Computer Graphics**
Ohio State University assistant professor of engineering graphics William Kolomyjec talks about his views on computer graphics as an art form.

HOME

26 **Taxes: Making the Most of Computer-Related Deductions**
Some tax time advice about deducting on-line time and computer hardware.



COVER
"Education in Transition"
TODAY examines the role of microcomputers and videotex in the education of American children and handicapped people.
photo by Tim Courlas

VIDEOTEX	**28**	**Charting Teletel's 3-V Experiment** *The only scientific findings on home videotex ever released to the public come from an exhaustive study recently completed in France. The results may have implications for home videotex in America.*
TECHNICAL/TUTORIAL	**34**	**Learning the Timex Sinclair 1000/ZX81 Keyboard** *If you got a Timex Sinclair for Christmas and are still struggling with the keyboard functions, here's a helpful tutorial that will have you mastering the keystrokes in short order!*
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INDUSTRY WATCH	**43**	**New Products** *TODAY keeps you abreast of the latest developments in videotex services, hardware, software and computer communications technology.*

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Letters

Please address your letters to CompuServe electronic mail, ID number 70003, 1372 or to: Editor, TODAY magazine, 5000 Arlington Centre Blvd., PO Box 20212, Columbus, OH 43220. TODAY reserves the right to edit letters for length, content and clarity.

Cover Letters

I just received my January/February issue of TODAY. I was somewhat surprised to find a cover photo that clearly illustrates two basic computer "no-no's:"

1. Placing of disks on top of the Radio Shack Color Computer, almost directly over the power transformer.
2. The close proximity of liquid to the computer, in the form of drinks setting inches from the vent slots of the Color Computer.

Really folks! You are supposed to know what you are doing. Don't encourage sloppy (or dangerous) habits around computers!

Mark Williams
Redlands, Calif.

Today I received the January/February issue of TODAY. The magazine seems to be improving to the point where it is marginally useful and interesting to me, and I compliment you for this.

However, I must point out to you that the people in your cover photograph are headed for real trouble, for several reasons. They have got all three of their disks lying around outside their protective envelopes where they will get all fingerprinted and dusty. The lady looks a little confused, though, probably because they have all these disks and no disk drive to put them into anywhere around. I can't tell what they are looking at on the screen so intently, but it certainly can't be CompuServe, because their videotex cartridge is perched on top of their computer, not plugged in where it will do them any good.

Henry Aldrich
Gainesville, Fla.

We can't cover this one up! It seems artistic license prevailed at the expense of technical accuracy and safety consciousness. We would like to point out, however, that diskettes were being used by our brandy-drinking couple, but the drives were placed out of sight for aesthetic reasons. Perhaps we can make up for the cover gaffe by publication of an excellent article on basic microcomputer care next month.

Subject Index

In earlier editions of TODAY you used to print the CompuServe subject index. Could you start putting this feature into the magazine again? I realize that there is an electronic edition of the index that is available on-line on CompuServe and I use that very often. When I use the electronic index, though, I use it to find something that I know already exists. When I had a printed index in the magazine, I often saw databases that I didn't even know about. The complete printed subject index gave me a chance to find new databases that I had missed on the "What's New" page or that I had just never heard about.

I realize you have a responsibility to TODAY readers who don't subscribe to CompuServe, but please remember the readers who do subscribe to CompuServe.

Scott Jones
Charlotte, N.C.

The subject index is scheduled to reappear soon in a restructured format.

Electronic Bounce Back

Instructions/Tips

STEP 1. Enter Electronic Bounce Back through User Information item #11 or Go EBB-1. Once you are familiar with this service you may wish to save time and skip the introductory pages by going directly to EBB-4 (Go EBB-4).

STEP 2. At the EBB menu, select either item #1 to receive an index of advertisers or item #2 to go directly to the ordering section.

STEP 3a. Selection of item #1 will display a list of issue dates from which to choose.

— Once you have identified an issue date, you will be presented with an alphabetic listing of advertisers unique to that issue.

— you may wish to review the entire list of advertisers or you can interrupt the list by typing Go EBB-4 at the end of any page. This "Go" command will return you to the information ordering page.

STEP 3b. Selection of item #2, on page EBB-4 (step 2) will prompt as follows:

Enter Advertiser(s) names(s)
>

If requesting information from more than one advertiser, separate their names with commas, i.e. Company A, Company B. By doing so, you will not have to reenter your name and address for multiple advertisers. **NOTE: Be sure to enter advertisers' names, NOT product names.**

Enter month in which ad(s) appear
>
Enter your name
>
Enter your street address
>
Enter your zip code
>
Enter comments or questions up to a maximum of 3 lines of 132 characters per line

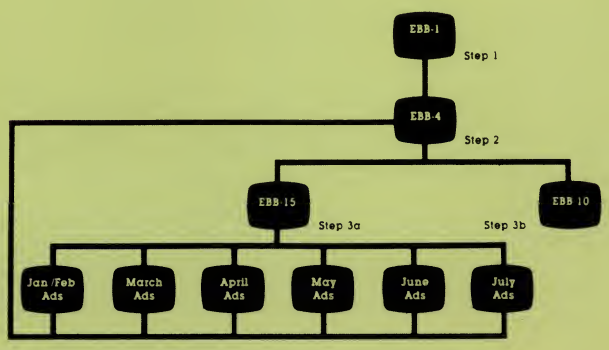
>
>
>

This is your opportunity to specify the nature of your inquiry. Keep in mind you will be communicating directly to the advertiser and not to TODAY magazine or an independent clearing house.

If you do not wish to enter a special message, simply key ⟨ENTER⟩ at each of the three > prompts.

NOTE: These comments will be received by all advertisers listed above. To make specific comments unique to multiple advertisers, simply repeat Step 3b.

After completing your request, you are returned to Step 2.



Electronic Bounce Back puts you into direct contact with our advertisers.

When you respond to an ad in TODAY Magazine, you're "talking" directly to the advertiser. This means an end to the weeks of delay it takes for an ordinary reader service card to reach an advertiser (not to mention the additional time lapse for an advertiser to answer your inquiry once it is received).

EBB not only lets you respond to an ad with the usual name and address information, but it also allows you to ask for specific information, leave additional comments or in some cases even order a product. The advertiser in turn can reply, if so desired, through our electronic mail system, Email™.

TODAY is the first magazine to develop an "electronic" reader service and take advantage of the 2-way communications capabilities available through the use of videotex technology.

Electronic Bounce Back is easy to use. Just GO-EBB and follow the prompts. EBB will allow you to review an index of advertisers or go directly to the ordering section. Users of EBB will be able to request information from present advertisers in each issue of TODAY as well as from advertisers in past issues.

So GO-EBB and give it a try. We've cut out the middle man so CompuServe customers and advertisers can communicate directly with each other. This means a faster response to your inquiries and an added convenience for TODAY readers.

TODAY

THE VIDEOTEX/COMPUTER MAGAZINE

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Columbus, Ohio 43220
(614) 457-8600

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Dear Reader,

There is something that makes TODAY unique among the plethora of computer magazines. That "something" is called interactivity. The technology that provides the interactivity is called videotex.

Videotex, not long ago considered a technical toy, is very real to most of the 70,000 TODAY readers who can communicate directly with TODAY editors, writers and advertisers via the CompuServe Information Service.

As TODAY begins monthly publication with this issue, we invite our readers to take advantage of the interactive connection to help us shape future issues. Tell us what we can do to make TODAY magazine more viable and interesting to you. Let us know what types of articles you would prefer to read as well as the types you would prefer not to read. Let us know what you think of the new Electronic Bounce Back, the program that permits readers to communicate directly with advertisers.

Readers may channel comments, suggestions and questions through FEEDBACK (GO CIS-8) or electronic mail (GO EMA) to User ID number 70003,1372.

* * *

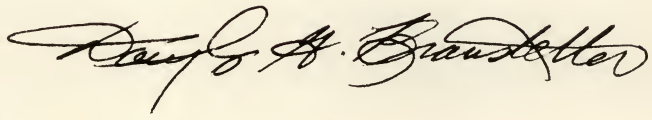
Before offering suggestions, many readers have a question: "What is the editorial direction of TODAY?

The content of this issue provides a sampling of the features we'll offer in the coming months. Articles that highlight the effect of videotex and microcomputing on our society will be prominent. Both the major feature on educational computing (page 16) and the special report on how the lives of handicapped people are changing in the face of advanced micro technology (page 9) reflect our commitment to exploration of the social ramifications of the New Technology.

We will continue coverage of major product and technological developments at CompuServe. But we don't live in a vacuum. Industry-wide videotex experiments and technical advancements affect us all. This month we're publishing results of a French videotex experiment that has yielded the most detailed scientific findings on videotex usage ever released (page 28). The results could have an effect on the development of videotex services in this country.

Finally, to round out the magazine, we will offer selected technical/tutorial articles as well as hardware, software and book reviews and new product announcements.

We hope you will enjoy TODAY magazine and that you will find it useful and informative. In the event that you don't, rest assured that our "interactivity" provides you with an easy and effective way to let us know!



Douglas G. Branstetter
Editor

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8″ DSDD Soft Sector (512 B/S, 15 Sectors)	3114	3.34
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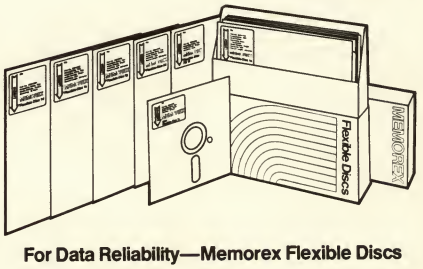

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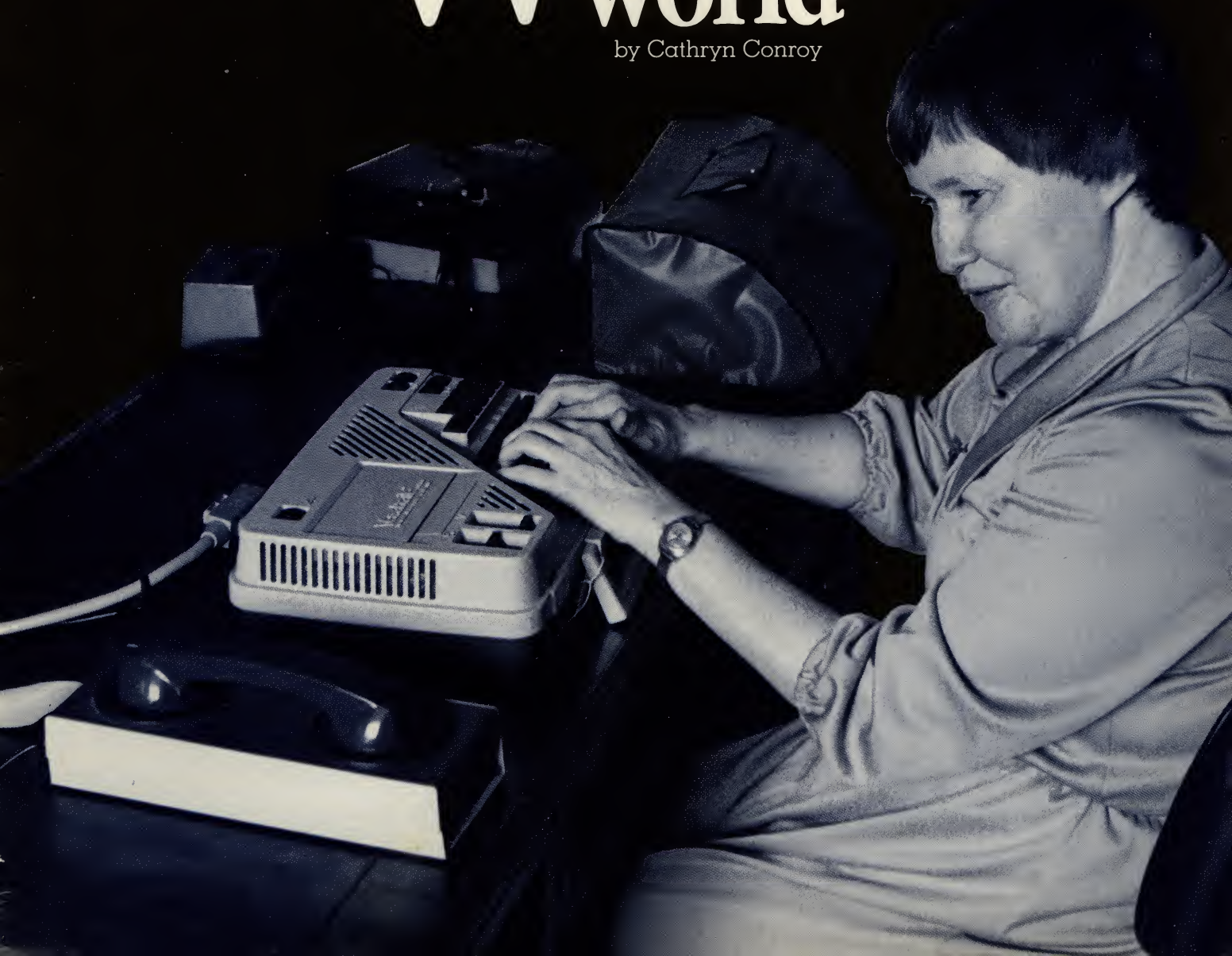
Special Report: Micro Miracles for the Handicapped

An explosion of technological wonders, including sensory devices for the blind and special system applications, software and networks for the deaf, is putting the microcomputer to work for the handicapped. For the first time in history, blind and deaf people can be on equal footing with their sighted and hearing peers in education, the job market and even in certain recreational and social pursuits.

She is blind and deaf, cut off from the world, unable to communicate or participate in the life around her. When younger, Georgia Griffith was a lover of music and after graduation from Capital University in Ohio taught school children the joy of song until her hearing failed and left her in a dark, silent space. But because of her computer, that darkness and silence is not quite as penetrating; it allows her to work for the Library of Congress as the only braille music proofreader in the U.S.; it allows her to carry on conversations with friends and strangers across the country. It allows her to participate in life.

Window on the world

by Cathryn Conroy



He has been blind since birth and although, as he says, his eyes are broken, David Plumlee is normal in every other way. A music scholar who graduated with highest honors from Oklahoma Baptist University, Plumlee is married and works as a typist for the federal government. He has an insatiable desire to work and play with computers, so much so that his wife has dubbed his TRS-80 as "David's girlfriend."

Computers and the blind? It's not so incredible as it seems at first thought. With innovative and somewhat affordable sensory aid devices now coming on the market, more and more blind and visually-impaired persons are able to read a newspaper, check on the weather, look up something in the encyclopedia and even work at a challenging job — all with the aid of a computer.

The enormous impact computers are making on the lives of the blind can be likened to the vast changes caused by the invention of the printing press, which Mark Twain once called "the incomparably greatest event in the history of the world."

Dr. Larry Scadden, president of Rehabilitative Technology, Inc. of Arlington, Virginia, says, "The quality of life for blind and visually impaired people can be substantially improved through the application of appropriate technology. The most dramatic improvements will stem from advances in techniques of communicating and manipulating information. Computer technology is the foundation for these advances.

"The implications of this change in technique for the acquisition and communication of information upon the lives of blind and visually-impaired people can be shown to be extremely positive in three basic areas of life — education, employment and personal independent functioning. The cause for this optimisim is the fact that blind and visually impaired individuals will, for the first time, be able to participate equally with their sighted peers in activities requiring the acquisition and manipulation of printed information in a manner nearly identical to sighted people."

Computers are already having a marked effect on the educational process of all people, and in some cases they are replacing the teacher and classroom with a new option — home study. Naturally, the interactive computer will enable blind students, who are equipped with appropriate sensory aid devices, to participate in such programs, making education, for the first time in history, equally accessible to them.

The Chicago-based and fully accredited Hadley School for the Blind

Georgia Griffith "talks" with TODAY art director Thom Misiak on her VersaBraille system: "... This machine is my only communication."

is actively exploring the future use of computers. Hadley is the world's only correspondence school for the blind. Founded in 1920, Hadley offers over 125 brailled and/or recorded courses for more than 4,000 blind students throughout the world, all tuition-free. High school, vocational, college and hobby courses are available; each student is a "class of one," studying at home at his own pace. Hadley students study with braille and large print textbooks as well as cassette recordings; a toll-free WATS line enables students to call for personal tutoring and assistance.

This rather limited interactive experience will soon change, according to Dr. Robert Winn, president of Hadley. Winn foresees great potential in the use of the computer in educating blind students and says that within the year Hadley will have its first on-line courses. "In the next six months we'll begin limited demonstration projects transmitting textbooks using personal computers and sensory aid devices," explains Winn.

On-line courses will obviously open up a new type of education for blind students, giving them equal access to all types of courses of study heretofore unavailable to them. And with changes in education, come changes in employment. With the aid of the computer, the blind will not be left out of challenging jobs.

The Department of Labor estimates that by 1990, 60 million out of 110 million jobs in this country will be at electronically-based job stations. Blind persons can be equally competitive and qualified for the majority of these jobs, greatly expanding employment opportunities for them.

"Futurists say that so much will be done by telecommunication links that half of our work force will be doing work at home by the end of the century. Again, this makes us realize that it is the electronic manipulation, storage, retrieval and transmission of data that will be the basis of jobs in this country. And the blind will finally be able to participate," explains Scadden.

Georgia Griffith is already participating in computerized work at home. In addition to her job with the Library of Congress as a braille music proofreader, Griffith serves on the board of directors of the National Braille Association and as a systems operator of NIPSIG, a special interest group on the CompuServe Information Service.

Equipped with a microcomputer and a VersaBraille system, which is a small cassette machine that prints computer braille, Griffith is able to communicate with her employers at the Library of Congress from her home in Lancaster, Ohio.

"Since I am deaf-blind, this machine is my only communication. I call friends who have computers and we talk. I have even called people I met on CompuServe," says Griffith, who

goes by the handle "Angel" when using the Service.

"Can you imagine someone who never hears the news, never reads a paper or seldom talks with people? This made a new life for me. A friend set up a computer keyboard that attaches to my VersaBraille. If you were here, you could type, and it puts braille on the VersaBraille. My speech is clear, and we could talk," she says.

Griffith uses her computer about five hours a day, successfully integrating satisfying, paid work with the sheer pleasure of communicating with others.

In fact, the blind who do have access to personal computers are discovering so much pleasure in computer communication that many turn to it for recreation and personal independent functioning.

"Look at all of society, and it is easy to see already the amount of recreation that is computer-based. And this is rapidly expanding," comments Dr. Scadden.

One such blind person who is avidly using his computer for fun and information is David Plumlee of Independence, Mo. "I first read about computers in a braille magazine, the *Braille Technical Press*. I've always had a mind bent toward logic, electronics and mechanical things. When I was little I discovered blindness was a handicap, and so I looked for something I could rely on, something that was secure. Electronics is that something," says Plumlee.

Using an Optacon, an electronic instrument that is an optical tactile converter, Plumlee is able to "read" his CRT. One hundred forty-four pins are crowded onto a small bar, which is molded like the underside of a finger. The Optacon reads the letters on a CRT and the pins spring up in the actual shape of an alphabet letter. This is unusual because it is not in braille and so takes longer to learn to use. With an unfamiliar text, Plumlee says he is able to read 20 words a minute.

It may be very time consuming, but Plumlee loves every minute he spends in front of his TRS-80 computer. One of his favorite activities is participating in CompuServe's Orchestra 85, where he has been able to write down organ music he has composed so that other people could retrieve it and play it, something he was unable to share with others for many years. "It helps me to handle my blindness better," says the former college music major.

In addition, Plumlee is currently designing a program that will enable him to draw electronic schematic diagrams that others will be able to read. To help him keep track of his checking account, the computer whiz has also developed a checkbook program that allows him to input the values of his checks and keep track of his balance.

Rehabilitative Technology, Inc. President Larry Scadden: "It's absurd to have the technology and not get it into people's hands."

Plumlee utilizes his computer for various other record-keeping operations, including health care. Since he has high blood pressure, he enters his weekly readings into the computer, and, using a program he wrote, he is able to generate a file of readings and a bar graph to give to his physician.

The computer games craze that is sweeping the country is leaving the blind out, since in order to play one must be able to visually track a miniature figure across the screen. Plumlee does play a few games that don't work in "real time," such as checkers and tic-tac-toe, but after a while the challenge diminishes. So he is putting his mind to work and is now attempting to design computer games for the blind based on sound output, such as different tones, that would test reflex time.

The prospects for the blind utilizing computers for educational, employment and recreational purposes are exciting, but obviously one major concern is availability of the microcomputers and the vitally necessary sensory aid devices.

Dr. Scadden, who is himself blind and serves as a consultant for various organizations, including Hadley School for the Blind and Triformation Systems, Inc., a company that is developing sensory aid devices, says that the intervention of society is required for computerized education and employment of the blind to succeed.

"There is interest in making sure the appropriate equipment gets into the hands of the blind. Social service agencies can assist in the distribution of the technology, but it will have to be done at the local level. It is possible to set up a microcomputer, speech synthesizer, a modem and the appropriate cables for under $1,000. This price puts it into the range of families and small, local service clubs who want to help the blind," says Scadden.

There are a half million people in the U.S. who are considered legally blind, although only 100,000 of them are totally blind. In addition, more than two million suffer from severe visual impairment, requiring some kind of alternative visual display in order to read.

"The total number of blind persons who have personal computers must be measured in hundreds rather than thousands, but the number is probably between one and two thousand now counting those in institutional settings with access to a larger system. In addition, there are nearly that many working as computer programmers, but most of these individuals only have access to computers for work purposes and not for personal use.

"The number of blind people with access to computers for personal use is under 2,000, less than four tenths of one percent of the nation's legally blind

population. I feel certain that the advantages that can accrue from such technological capability are higher for the physically and sensorially disabled than for any other population group. It's absurd to have the technology and not get it into people's hands," says Scadden.

That technology and everything else that deals with the blind has always been slightly behind the rest of society. "The first step in technology to aid those who cannot see was the production of braille on paper. Much later a computer was used to generate braille, and by 1977 this gave new ideas to some forward-thinking companies, such as, if a large computer could do this, so could a smaller one," explains Scadden.

"Some began playing around with recorded speech, but this was very expensive. People were working individually around the country and then all at once discovered each other and began working together. By 1978, inventors had created speech output for the smaller microcomputers, but they were just playing around, and there was not much application for the blind at large. We've seen a great deal of expansion since then with Telesensory's paperless Braille, the Kurzweil commercial reading device that reads texts aloud, and the up-and-coming braille writer to be marketed this spring by Maryland Computer Services," continues Scadden.

He goes on to say, "Society as a whole will be utilizing computer terminals to produce, transmit, receive, store and retrieve information. The only difference between the blind and visually impaired population and its sighted counterpart will be the mode of the resulting information display. Blind persons will use braille and/or speech output displays rather than the ubiquitous alphanumeric displays. The technology for each of these forms of information display is already available and is being used by a select few who have the specialized knowledge regarding its availability

But disseminating this knowledge requires more than merely providing the appropriate hardware and software; it also requires education. To assist with this, Hadley School for the Blind is preparing to offer on-line courses in the use of a computer as well as the use of sensory aid devices.

Even with formal education does the blind population suffer from user anxiety or computerphobia as does much of the sighted world? Opinions differ on this matter, and according to Lee Brown, president of Visually Impaired and operation. The future requires the dissemination of this knowledge to the entire blind and visually impaired population."

Data Processors International (VIDPI), an affiliate of the American Council of the Blind, "there is a genuine desire to grab the technology.

"User anxiety among the blind is less than among the sighted because we have been disadvantaged for so long. We are starved for information, current events and reference facts. We're not afraid of computers, and we're not afraid it will take over our lives," says the man who boasts of being the first blind person to read the *New York Times* on the CompuServe system.

"Computers and information services such as CompuServe are providing the blind with data we never had before. We can now read books, do shopping and even read today's newspaper today. That's quite a big thing, and it's going to revolutionize our world. It is changing our lives," he goes on to say.

Dr. Scadden disagrees somewhat with Brown's position, although he strongly believes that computers are valuable for the blind. "The technology does intimidate people. What we have to do is teach the blind that it is fun and not hard to use. That's why I work with companies who are designing and producing products to make computers easy to use.

"The blind are no different than anyone else. Once we build up an acceptance of the technology, it is then possible to teach the skills involved in use. Not all will program computers, but they can still use them to access information previously unavailable to them," Scadden explains.

Access to the world through computers is exciting for the blind, but they are also faced with several real problems that sighted users do not have. A major problem, of course, is data capture. Even with sensory aid devices, a blind person cannot mentally process the information on the computer screen as fast as a sighted person. The text on the screen must be stopped, or most of it will be lost.

David Plumlee says he has solved the problem of data capture by using a disk file. "I save the information from CompuServe on the disk file, sign off the system and read it. Then if need be, I log back on to answer or respond to the data. Since I can only read 20 words a minute, I just can't keep up; besides, it would cost too much to do it any other way."

Other less serious problems include a lack of standardization in the control codes, causing difficulty in using unfamiliar computer systems that do not allow the blind user to stop the display in order to read it, the vital importance of providing good documentation, system maintenance and the expense of sensory aid devices necessary to use the computer.

The blind who are using computers and teaching others to do so view these obstacles as challenges, not barriers. Says Plumlee, "More and more blind people are getting on the national information networks like CompuServe, and we're managing quite well. I'm not ashamed to tell people I'm totally blind because I want to see us become more visible to the sighted world. Blindness is something I have to live with day after day, and a lot of times I will need special help or accommodation. I always let it be known in an open message on the computer that I'm blind; I don't try to hide my handicap.

"People think the blind are either totally incapable or are amazing and can do anything. Both views are a folly. Life around me is a mixture of dependence and independence. Both are prominent. My own hard work was not sufficient to get me where I am today. I needed others' help. I can't claim I got there by myself."

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"People think the blind are either totally incapable or are amazing and can do anything. Both views are a folly." — *David Plumlee*

Gallaudet College's Dr. James Pickett at the school's sensory communications lab: Looking to the wizards of high technology for a miracle

BREAKING THE SOUND BARRIER FOR THE HEARING IMPAIRED

by Francine Sevel

In a much-loved fairy tale, the Wizard of Oz uses his power to create hope, cure afflictions and change the lives of a lovable cast. The Scarecrow is granted a brain, the Tin Woodman receives a heart and the Cowardly Lion is filled with courage. Today, teachers working with hearing-impaired students are looking to the wizards of high technology for similar miracles from a new and more powerful Oz — the computer.

Computer-assisted instruction and computer-based education offer tremendous potential for helping the deaf overcome the problems of acquiring and disseminating information, according to Robert Stepp, director of the Educational Medial Production Project for the Hearing Impaired at the University of Nebraska-Lincoln. "It's one of the most useful tools for the deaf, we've had in the past 50 years," he says. "It takes away the sound barrier and enables them to interact with the microcomputer in the same way the hearing do."

According to statistics compiled at Gallaudet College, the world's only liberal arts college for the deaf, an estimated 16 million Americans are deaf or hearing-impaired. Their most significant problem is lack of access to information, says Susan Rose, an assistant professor on the Faculty for Exceptional Children at Ohio State University. "Their lack of speech and inability to hear are really secondary issues," she asserts. "Most of us have no appreciation of our own hearing and don't have any idea of the tremendous barrier to learning that deafness causes."

Michael Karchmer, director of the Center for Assessment and Demographic Studies at Gallaudet College points out that traditional educational methods have not worked well with even the brightest deaf students. "The reading picture is not good," he reports. "Eighteen-year-olds read, on average at about the fourth grade level and do math at about a seventh or eighth grade level."

According to OSU's Susan Rose, one of the reasons for this abysmal educational record is that teachers working with the deaf traditionally tried to teach speech, followed by language before actually giving students information. Large amounts of time were spent on the means to the end — knowledge — with little time left over to actually convey the information. The new method for teaching deaf students, says Rose, advocates conveying information visually and then teaching language and speech. Because the computer allows for visual input and manipulation, it's an ideal tool for teaching the deaf.

"The computer allows us to capitalize on the child's assets — to increase his strengths," says Rose, who adds that computer graphics are used to help deaf students solve problems visually. "Once the child masters concepts with the computer, we introduce language to correlate with what has already been learned."

In addition, deaf students receive many of the same benefits from computer instruction that hearing students do: individualized attention, positive reinforcement and immediate feedback. But unlike hearing children who rely on a number of ways to receive information, deaf students are severely limited in this regard. For them, computers represent the first line of communication that does not in any way exclude them. Educationally, computers offer the deaf a marriage between communications and technology that provides them an outstanding method for acquiring, processing and disseminating information.

Plenty of enthusiasm

By and large, the response of deaf students to computer assisted instruction has been very positive. An introductory computer course first offered at Gallaudet College two years has grown to meet the demands of the school's 425 students. Eleven sections of the course are now offered at Gallaudet's Model Secondary School for the Deaf.

The California School for the Deaf at Freemont reports similar success. Says Margaret Irwin, coordinator of the school's computer assisted instruc-

Elementary students at the California School for the Deaf CAI lab: Kids never act jaded about the computer

tion: "Motivation is very high. I've never seen the kids act jaded about the computer. They'll behave for a week to have forty-five minutes on the computer—on material that would turn them off if they had to do it on paper."

A 1982 report by American Instructors of the Deaf shows widespread acceptance of microcomputers at the grassroots level. Data processing, language arts, geography and environmental awareness are among the traditional topics deaf students learn through computer assisted instruction, while lip-reading and other subjects directly tailored to their special needs are also taught.

Although enthusiasm is plentiful regarding computers as tools for educating the deaf, funds are not. Results of a recent national survey conducted by the Educational Media Production Project for the Hearing Impaired show that the number of computers in each school is generally inadequate to meet the demand. As one researcher pointed out, "Teachers and students need easy access to computers. A lone computer stuck in the school library doesn't do anyone much good."

Software problems

Lack of appropriate software—cited as a problem by many teachers of hearing students — also creates difficulties for deaf children. "Language is the major problem," says Robert Stepp at the University of Nebraska. "It's often far above the reading level of hearing-impaired students."

The software problem has led many teachers to create their own programs, which vary in quality from very poor to excellent. Margaret Irwin at the California School for the Deaf has created a program specifically for use with hearing impaired learners. BLOCKS provides the framework for teachers or parents with no programming experience to create illustrated computerized lessons for any subject or grade level. It requires an Apple II Plus micro with 48K memory, 3.3 DOS, and two disk drives. BLOCKS interfaces with any programming language and has been used successfully in the U.S., Canada and Scotland. The program includes disks for authoring, class and storage, a graphics library with more than 7,000 images and a BLOCKS lesson sampler consisting of more than 20 lessons for a variety of grades and subjects.

Response to BLOCKS has been tremendous, says Irwin, who made the program available in 1980. "By the fall of 1981 we had disseminated about 3,000 disks," she reports. "For a while it was the only thing we were doing."

At Nebraska's Educational Media Production Project for the Hearing Impaired, researchers are evaluating software and identifying what is usable without major modifications for use with deaf students. "It's expensive and difficult to adapt materials for the hearing-impaired," says Marnell Armstrong, one of the Project's media search specialists.

Other experts fear that some software is merely "electronic programmed workbooks" and "electronic dittos" that relies solely on a drill and practice approach to educating the deaf. And, by and large, teachers of the deaf are no more equipped than teachers of hearing students to use the computer creatively. Dick Ricketts, editor of *The Computing Teacher*, estimates that only about three percent of all teachers are truly computer literate.

Visual learning

While teachers of both hearing and deaf children struggle to catch up with and master the intricacies of computer, researchers work on methods to help the deaf assess and absorb information. Generally, this research falls into two categories: that focusing on the application of technology to the development of language and communication skills, and that related to the process of information dissemination.

Researchers see tremendous potential for linking video media and computers. Because the deaf are visual learners, the exact representations of life and motion by video offers a major advantage over the abstract representations of computer graphics. According to Rod Brawley, a designer at the California School for the Deaf, Riverside, "video is the best representation of life until we get to holograms (a lensless, photographic method that uses laser light to produce three-dimensional images)."

Several designers have experimented with applying video/computer technology to the development of language and communication skills. One of the most notable video projects

is the DAVID system developed by researchers at the National Technical Institute for the Deaf, Rochester Institute of Technology. Designed to improve the handling of visual stimuli, DAVID is an interactive videotape system that can present stimuli of any duration and in any order. The system is a highly flexible educational tool for drill and practice as well as for simulations in communications training.

Presently, DAVID software consists of three programs: a speech-reading exercise; a lesson in sign language or word, sentence and paragraph reception; and a simulation of a real dialog job interview. The hardware is a Solutions Corp. random-access video equipment controller (RAVE) using a Z-80 microprocessor. This controls the modified videotape recorder (VHS format, JVC Model BJ6400U or Betamax format, Sony Model SL0323). The controller interfaces with an Apple II Plus microcomputer with three five and one-quarter disk drives.

Another program, Interactive Language Instruction Assistance for the Deaf (ILIAD), created by Kirk Wilson of Learning Tools, Inc. applies artificial intelligence to software development. Wilson describes ILIAD as a generative computer system that aids deaf students in the production and comprehension of written English sentences. ILIAD's intelligence is in the form of "knowledge" regarding the structure of English and the skills to provide individualized tutorials on various aspects of language use.

"ILIAD is most appropriate for children with delayed language development," says Wilson, who reports that the program has been tested with great success at the Boston School for the Deaf.

Networking for the deaf

The challenge of helping the deaf improve their capabilities to assess information is being addressed by DeafNet, a computer network created specifically for the hearing impaired. DeafNet disseminates information of special interest to the deaf, such as lectures presented with sign language and captioned films. A survey of network use showed an average individual use of three nine minute accesses to the system every two days. SRI, a California-based consulting firm, will help community leaders in 20 major cities establish DeafNets over the next two years. Once these local networks are in place, they will be joined together to form a national communications network for the deaf.

Real Time Graphic Display is another method of helping the deaf learn. According to Ross Stuckless, director of the Office of Integrative Research at the National Technical Institute for the Deaf, Rochester Institute of Technology, more than 50,000 deaf students nationwide attend classes with hearing students. Graphic displays of information offer these students a better opportunity to learn in a "mainstream" educational environment which mixes deaf and hearing students.

Helping deaf and hearing impaired individuals to cope in an increasingly technological world is a challenge that offers no quick and easy solutions. But by harnassing some of that technology through the use of microcomputers as educational tools, teachers and researchers have taken an important step in giving the deaf a way to break through the barriers of silence.

Francine Sevel is a free-lance writer from Columbus.

Class time at the Rochester Institute of Technology: Graphic displays allow deaf students to attend classes with hearing students

EDUCATIONAL COMPUTING:

by Carole Houze Gerber

There's a lot to Learn

The Bing Nursery School in Stanford, California uses six of them to teach preschoolers up from down and left from right. A parents' club in Brentwood, Tennessee bought two for use in an enrichment program for gifted students.

Worlds away in geography and lifestyle, delinquents and ex-convicts at New York City's Fortune Society for former offenders, use half a dozen of them to reinforce math and reading skills.

In Atlanta, Georgia and Sims, Connecticut, the privately-run National Computer Camps have 50 for their summer programs which draw privileged youngsters from across the country. At the other end of the social spectrum, migrant children in Huntsville, Texas use 11 provided by the federal government for remedial programs.

From coast to coast, mountain to plain, computer education has taken the country by storm. According to recent figures compiled by Harvard's Graduate School of Education, nearly 1,200 schools or other educational settings offer computer courses.

Agriculture and adult education, electronics and energy, philosophy

and programming are among the nearly 70 subject areas offered nationwide, according to the Harvard survey, which showed that elementary and secondary schools are joining the computer revolution in a big way. Whether it's a single Commodore PET in a library learning center or, as one school calls its dozen Apples—an entire orchard—schools are scrambling to add computers to their curriculums. According to recent figures in *U.S. News and World Report*, about one in eight of the nation's 40 million elementary and secondary students will use classroom computers this year — up 50 percent from 1980 figures.

What fascinates children most about computers, says Dr. Michael Zabinski, director of the five-year-old National Computer Camps, is that they do exactly what they are told to do. So what, specifically, are the country's junior computer operators telling the machines to do? Nothing very interesting, laments Dr. Vicky Blum Cohen, an expert on instructional design and evaluation.

Poor software

In a research project at Columbia University Teachers' College which evaluated educational software, Cohen found that 95 percent of software packages available to students deal with simple arithmetic. "It's pretty much strictly 'drill and grill,'" she says. "It doesn't challenge students to think for themselves or to deal with concepts.

"Small cottage industries comprised of enterprising programmers who want to make a quick dollar (developing software) dominate," Cohen reports.

Suzanne K. Damarin, an assistant professor of Education at Ohio State University, agrees that quality of programmed instructional materials is dull, to say the least. Damarin heads a government-sponsored project called TABS — Technology and Basic Skills in Mathematics — which is developing computer and videodisk curricular materials for children in grades five through eight.

"It's important to remember," Damarin points out, "that computers were invented for the purpose of performing tedious tasks that human beings would rather not do. I find it ironic that much of the educational software being designed today uses the computer to lead children into learning just such procedures."

A major reason that school computers aren't being used as creatively as they might be, says David Moursund, president of the International Council for Computers in Education (ICEE), is because of the large gap between teacher training and the infinite and exciting possibilities offered by this new technology. Moursund, who is also a professor of Computer and Information Science at the University of Oregon and editor of *The Computing Teacher* and the *ICEE Newsletter*, says that many teachers fall back on dull software packages because they are unsure of how to use computers in anything but the most routine manner.

"The more innovative use of computers as a problem-solving tool isn't going on very much," he contends. "They're used mainly for routine drill and practice, for game-playing as a reward for good behavior, and for routine programming because most teachers aren't yet trained to know how to use them creatively.

"The overall teacher training problem is immense," Moursund asserts. "Some two million teachers out in the field need a minimum of a one-day workshop just to get them off the ground. We're producing thousands of teachers every year and many of them are still completely computer illiterate. The colleges of education must address this issue!"

Eventually, says Moursund, teachers will need the equivalent of two to three years of college computer courses to stay ahead of the demands —and sophistication—of the growing numbers of students who want computer training. Through his newsletter and journal, Moursund and his staff aim to inform and educate elementary and secondary teachers on the quality of available hardware and software. The journal also includes book and film reviews and how-to articles on using classroom computers. The three-year-old ICEE grew out of the Oregon Council for Computers in Education, a statewide organization dedicated to the instructional use of computers. It now has 10,000 individual and 31 organizational members.

While computer educational groups push for the longer-term goal of appropriate college training for future teachers, inservice training helps those already in the field prepare to use computers in their classrooms. According to Henry Olds, editor of the Boston-based electronic computer journal, *Window*, teachers can be taught in three hours to use computers "in at least one important way." His teacher-training workshops focus on de-mystifying computers and helping teachers learn to use them "in a relevant and satisfying manner."

Olds, who says one of the major uses of computers is as an information management tool, explains that immediate, hands-on experience is the key to training teachers. "I start all my teacher training programs by having the teachers use a small database program. They start out immediately by taking a tool and using it specifically for something they want to do. Once they've created one database program, they can go on and create more. The teachers no longer view computers as complicated and mysterious machines — because they are doing something meaningful with them. They can then begin immediately to apply what they've learned to using computers in their classrooms."

Olds' publication aims to help school personnel stay up-to-date on uses for classroom computers. *Window* is distributed on disks and contains articles on effective uses of computers in education, reviews of software, and other materials. Users currently need access to Apple II computers, but Olds says *Window* is being adapted for use on other equipment.

Educating the teacher

Teachers and administrators have traditionally depended upon sales representatives and advertising materials when buying educational materials, points out Kenneth Komoski, executive director of the Educational Product Information Exchange (EPIE) at Teachers College, Columbia University. Komoski contends that over the past 25 years fewer and fewer educational companies are deluging teachers with a vast number of textbooks and other materials. Deciding upon what software to purchase is yet another difficult choice that educators must make from a dizzying array of attractively packaged educational products. Because many teachers lack the time or the knowledge to evaluate or test hardware or software packages, they very naturally fall for advertising pitches.

Illustration by Mark Ulrich

Helping teachers distinguish between a good pitch and a good product has been a long-time goal of EPIE, which for many years has provided a systematic way of analyzing more traditional elementary and secondary course materials. The organization publishes and disseminates its findings in the U.S. and Canada through the *EPIE Materials Report*.

Recently EPIE has joined with Consumers' Union, publishers of *Consumer Reports*, *Penny Power*, and other consumer-oriented publications, in a partnership to evaluate computer hardware and software for elementary and secondary school teachers. Consumers' Union is conducting tests of major microcomputer systems available to schools, while EPIE gathers field reports from users of the various brands and models.

"We'll compile information on the repair record on various pieces of equipment, the cost of repair and the amount of down time," reports Komoski. "On the software evaluation side, we've begun to develop a national network based on the Urban Superintendents' Technology Consortium—school districts in New York City, Salt Lake City, Albuquerque, Houston, Cincinnati, Detroit, Boston and in central Florida and Illinois."

In addition to the information gathered through the Consortium, EPIE teams will conduct on-site workshops and training sessions in New York City and other areas to help teachers and students with software evaluation. All data will be distributed to EPIE members throughout the United States and Canada to help educators make informed decisions in purchasing hardware and software. Other EPIE goals include pushing for higher quality software and for hardware that can handle the wear and tear that a school setting entails. "Consumers in education are now settling for a 90 day warranty from computer companies doing a robust business," complains Komoski, "while even the ailing auto industry gives a one year guarantee. We'd like to see computer companies offer more reasonable warranties.

"We'd also like to see consistency between the computers purchased by parents for home use and those bought by schools," he adds.

While EPIE directors believe that hardware and software improvements will make use of computers in the schools a more successful undertaking, one EPIE official points out that some school systems bring on their own problems by trying to economize in the wrong places. Says Shonan Noronha, technical director of EPIE and a professor at Fairfield University: "Most schools try to get away on a low budget and everyone feels that software is more important than hardware, so they buy micros that hook up to television sets. That's a big mistake because it's hard to get the schools' televisions out of the studios or storage."

System-wide literacy

Not surprisingly, schools having the most success with computers in their curriculums are those that have bought software selectively, or developed their own, and integrated computer use into a variety of courses. The Lyons Township High School District in Lyons, Illinois and Niskayuna Central Schools in Niskayuna, New York are two school systems that have made computer literacy a district-wide priority.

The Lyons Township District introduced computers into its schools in 1981, paid for them with local funds, and, according to superintendent John Bristol, "made computers our number one priority." Rather than buy software first and ask questions later, Bristol hired a project director for computer curriculum development. Her task is to coordinate and develop teacher education computer programs that meet the needs specified by the district's teachers. "We want our teachers and students to realize that the computer is not just some accounting tool or a way to do drill and practice," Bristol says. "Rather, it is a tool

WHAT CONSTITUTES GOOD EDUCATIONAL SOFTWARE?

According to Columbia researcher Vicki Blum Cohen, the computer in the classroom plays a unique role because it has the potential of modifying the curriculum and absorbing many of the labor-intensive responsibilities of the teacher.

The computer can be used to perform three educational functions: as a supplement to the curriculum in the form of simulation, problem-solving, and drill and practice; as a basic course that teaches students a complete curriculum unit—in which case the computer functions as sole tutor; and as a curriculum records management system that keeps track of each student's mastery of educational objectives. Cohen lists the types of student-computer interactions as: drill and practice, tutorial, gaming, simulation, problem-solving, and exploration.

Among her criteria for good educational software are the following: instructional text that is formatted to the screen for easy reading; graphics that contribute to the learning process by presenting a visual model of the information to be learned, (bad graphics, she says, distract from the content presented and interfere with the intent of the program); appropriate cues and prompts that jog the memory of the learner; and user control that allows the student to "weave his or her own educational environment." This control may include the option to choose the pace of the program, the choice of sequence, the decision as to where entry into the program will begin, the option of exiting an activity at any time and the option of reviewing instructions.

Stanford researcher James Milojkovic has written that a successful educational software program will present the exercises as concisely as possible and at a reading level appropriate to the student's ability. A clear response mode that is consistent throughout will leave students no doubt as to how to respond, and the system by which they end their answers (by pressing "enter" or "return," for example) will also be consistent.

Finally, MIT Professor Seymour Papert, developer of LOGO, is credited with a simple but elegant simile that describes his view of effective use of computers in education. A computer should be used like a pencil, he has said. The pencil is universal and never dictates what students do with it. Instead, it enhances the user's ability to do anything he or she wants. When microcomputers become true educational tools, Papert claims, they will be used as readily and as unselfconsciously as the lowly pencil.

—*C. H. G.*

for decision-making and that's the application that ultimately will have its greatest power."

According to Julie McGee, project director for computer curriculum development, computers in the classroom have been well received by teachers — even those in non-mathematical courses. The success of "selling" computers to the teachers, according to one of the district's English teachers, is in pointing up their benefits to both teachers and students. "Computers can help me to be a better teacher," he explained. "And in some respects, can lighten my workload. You won't convince us to use them if you try to turn every teacher into a programmer."

Among the ways that the Lyons District is using computers is in English composition classes in text editing, in chemistry classes in interactive games that reinforce information, and in math classes to teach concepts. Lyons may be one of the few school districts in the country which will send its yearbook publisher disks of copy for printing rather then the traditional typed pages.

Several hundred miles away in Niskayuna, New York, Charles McCambridge, director of that district's instructional materials services, says that the introduction of computers into his schools' curriculums will "give students some personal control over technology."

In this affluent school system, giving students this personal control starts early. At Hillside Elementary, students in grades one through five gain hands-on experience through the school's unusual computer literacy curriculum. According to Barbara Relles, the school's library media specialist in charge of the computer literacy program, community volunteers play a large role in the success of Hillside's curriculum.

"We have fifteen volunteers who use a prepared manual that enables them to work with the children in a systematic instructional format," she explains. "The first segment teaches the child how to physically operate the computer — how to turn it off and on and so forth. The second segment shows the location and use of the keys. And the third segment teaches the child some basic programming techniques."

Relles says the school encourages children to borrow the computers for home use to gain additional experience. "Once the child becomes confident, the teacher's introduction of the computer into the classroom curriculum is easily accomplished," Relles adds.

Jean Bundy, who teaches fourth and fifth grade science at Hillside, says the computer's immediate responses give students the type of feedback they need. "It also makes them active participants in learning," she explains. "Also, the microcomputer can do things that aren't available in other media. I like to use it in teaching the circulatory system because it can simulate the circulation of the blood through the heart."

While most educators agree that computers in the schools are a good thing, many also note that there are as many opinions about how micros should be used as there are styles of teaching. In Minnesota, educators got a head start on deciding how to integrate computers into the schools when the Minnesota Educational Computing Consortium (MECC) was formed back in 1973 to coordinate instructional computing throughout the state. MECC is supported by the University of Minnesota, the state university system, the community college system and the state department of education. According to Shirley Griffing, editor of Dataline, MECC's international newsletter, money was appropriated to support the consortium's activities so that children in all school districts throughout the state—poor as well as rich — would have an equal opportunity to become computer literate.

MECC's specific tasks include facilitating statewide purchases of microcomputers, developing educational software and providing inservice training for teachers. Since its inception, MECC has distributed more than 5,000 computers and has provided training for thousands of teachers and students. "Minnesota has supported computer education in a bigger way than any other state," says Griffing proudly. "Our Instructional Services Division is dedicated to meeting the instructional needs of Minnesota teachers in all subject areas."

In California, a non-profit corporation called Computer-Using Educators (CUE) was established by teachers committed to expanding the use of

EDUCATIONAL NETWORKS: A TECHNOLOGY IN SEARCH OF A CULTURAL NICHE

In theory, the idea sounds great — a mushrooming growth of educational computer networks linking educators to one another and to vast amounts of information on the latest in teaching and technology. In reality, says Dick Ricketts, managing editor of *The Computing Teacher* magazine, presently there are barriers to their widespread use.

"In a local network, using the computer has to compete with talking face-to-face or using the phone," he says. "In long distance networking in many cases there are phone charges. In any case, it's a new medium in an embryonic stage. What would make it more appealing to those whose typing skills are rusty would be a satisfactory method of voice input that would result in text usable by a word processing program.

"It's really a technology in search of a niche," Ricketts adds.

Karl Zinn, a research scientist at the University of Michigan, has a more optimistic viewpoint. Zinn has a small grant from the National Science Foundation that is being used, in part, to create improved software for computer bulletin boards. While he thinks bulletin boards and networks have great potential — and are being successfully implemented in many parts of the country, particularly California — he says they need improvement.

Despite their drawbacks — understandable, considering the short time most have existed — thousands of networks exist serving not only educators, but hobbyists as well as many other professionals. A free-access bulletin board directory, described by its system operator as a "work of love" contributed by Pete Keller of Wayne Township, New Jersey, lists thousands of networks across the country. The directory consists of nine files and is arranged by international time zones within the United States. To access the directory, call (201) 694-7425. To list a system not on the directory, give Ed Gelb the information via the message section (option E at the command prompt) of the bulletin board: Ed Gelb's Data Base System, Wayne Township, New Jersey at the above-listed phone. Or users may leave electronic mail on CompuServe for ID number 70160,240.

—C.H.G.

computers in education. CUE has a microcomputer center in the San Mateo County Office of Education where teachers can gain hands-on experience and inspect models of all major microcomputers in a sales-free environment. The CUE staff is available to answer questions and aid teachers in making decisions about appropriate hardware.

One criticism of the number and variety of groups involved in developing, evaluating and advising about educational hardware and software is that — lacking any sort of universal standard or centralized information exchange — they are busily involved in re-inventing the wheel. Not so, says computers-in-the-schools proponent John Bristol, superintendent of the Lyons Township High School District. "The problem is that the wheel hasn't been invented. I think it's fair to say that we are all in the process of invention right now. This is a very new thing, and the more we are involved in inventing, the more involved we will be in the end product."

The Language controversy

According to recent figures quoted by *U.S. News and World Report*, about one in eight elementary and secondary students in the United States is likely to use a school computer this year. And no matter what specific activity takes place or what subject matter is covered, each successful exchange between student and computer will consist of four fundamental parts: presentation of the exercise by the computer; response by the student; checking by the computer of the student's response; and computer feedback to the student.

The other test is, of course, acceptance. And experts agree that children have taken to computers passionately and wholeheartedly, despite the shortcomings of current software.

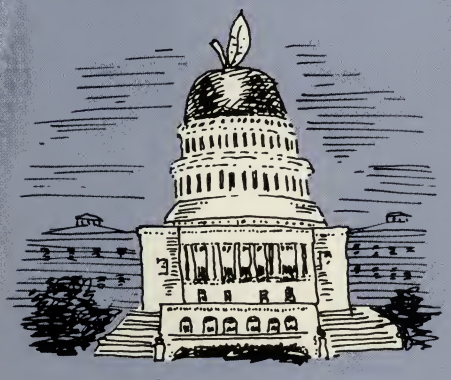
Equipping students with the most efficient and user-friendly method for conducting this interaction is a task that has kept computer scientists busy since 1964 when John Kenemy at Dartmouth College developed BASIC (Beginners' All-purpose Symbolic Language Code) for computer neophytes. Nearly 20 years later, BASIC is still the most widely-used language for teaching beginners the fundamentals. Because of its longevity, volumes of material exist on learning BASIC and nearly all microcomputers come equipped with the language.

Be that as it may, says Stanford researcher James Milojkovic, mastering BASIC is not an easy task for most people. Only those with mathematical aptitude find it a snap, he contends. Milojkovic, a research assistant for the Panel on Education and Technology in the recently-launched Study of Stanford and the Schools, calls BASIC a "usable but primitive" computer language that "encourages poor habits of computer problem-solving and a limited view of computing."

"We need to teach as a first programming language one that is learner-centered rather than machine-centered," he insists. "Fortunately, there exists a computer language called LOGO designed for easy access by computer novices, including children."

Milojkovic describes LOGO as offering learners a "mathematics-rich environment that gives them personal control over powerful computational resources... enabling them to explore the ways they and others think." LOGO makes use of a triangle, called a "turtle," that lives in the middle of the computer screen. The turtle's movements, controlled by the user's commands, leave tracings on the screen relative to the position and direction of the turtle. Through writing the appropriate LOGO code, the

AN APPLE FOR THE TEACHER — ALMOST



In a variation of the 1928 Republican National Committee advertisement that promised Americans "a chicken in every pot," bipartisan legislation introduced in 1982 was designed to help place a computer in every school. House Bill H.R. 5573 introduced by Rep. Fortney Stark (D-Calif.) and companion legislation sponsored by Senator John Danforth (R-Mo.) offered corporate federal tax reductions in exchange for donations of computer equipment to the nation's primary and secondary schools.

The bill, which passed the House with little trouble and cleared the Senate Finance Committee, snagged in the Senate when Howard Metzenbaum (D-Ohio) blocked the bill from coming to the floor during last December's lame-duck session. Since all unpassed legislation dies at the end of the congressional session during which it was introduced, the bill's backers grumble they will have to start at "ground zero" with the Computer Equipment Contribution Act in 1983.

Informally known as the "Apple Bill" because it was originally pushed by Apple Computer co-founder Steven Jobs, H.R. 5573 was described by many as a marketing device, tailored to Apple's specifications, that would simultaneously promote that company's image and help it unload obsolete inventory. The *Washington Post*, which opposed the bill in an editorial, reported that the bill was drafted by Apple's Washington lawyer, Eric Fox.

Except for Hewlitt-Packard, few of Apple's competitors endorsed the bill. According to John Jonas, an aide to Rep. Fortney Stark, who introduced the bill in the House, "Other companies saw it as a threat to their market share — namely, Apple giving away computers and cutting them out of selling them. Some saw it as a very expensive PR program that wasn't cost-effective.

"It's probably not cost-effective in the short-term, and maybe not in the long-term, either. The hardware is still pretty expensive and I think maybe if companies put their money into advertising and aggressive sales reps visiting schools, they'd come out better than giving equipment away. A lot of companies have looked at it and said 'Even

learner teaches the turtle how to draw various geometric shapes and designs. Milojkovic describes the "microworld of turtle graphics" as an excellent environment in which to learn the elements of programming.

Milojkovic, whose doctoral dissertation involves training teachers "for the purpose of empirically studying different ways of teaching LOGO," admits that LOGO has not yet had a national influence on the educational system. "But enthusiasm for LOGO is growing," he reports. "The 1980 book, *Mindstorms: Children, Computers and Powerful Ideas* by LOGO developer Seymour Papert is now the single most popular book dealing with computers in education."

International Council for Computers in Education President David Moursund also believes that LOGO can be a valuable learning tool for children. "The LOGO experience rapidly gets into problem areas such as geometry where the computer system and the student's programming skills become useful aids in learning new non-computer materials," he says.

For every expert opinion regarding computers in education, there seem to be equally well-founded opposing points of view. Selection of computer languages in school programs is no exception. Donald D. Spencer, a computer science consultant in Daytona Beach who has written more than 90 computer books, says that BASIC not LOGO, should continue to be the language of choice in teaching children.

"While I think LOGO is quite useful in the early grades because of its simplicity, I'd like to start children in grades four and up using BASIC," he says. "It's pointless to talk about using LOGO when most machines aren't equipped to handle it.

"BASIC is a very powerful tool that can be used in many areas," Spencer says, disputing the claim that it is a primitive and limited language. "Anyone over the age of nine or ten can learn to use it. LOGO has no use in secondary schools," he adds. "I don't believe it's going to become the general language used in education."

Eugene Galanter, a Columbia University professor who is chairman of the Educational Standards Review Board for the CompuServe Computer Schools, agrees with Spencer's assessment. "There are differences between LOGO and BASIC and I certainly don't think that one or the other should be selected indiscriminately," he says. "We've chosen to teach BASIC in the CompuServe Computer Schools because we believe it's the best and most adaptable language."

Galanter, whose book *Kids and Computers: The Parents' Microcomputer Handbook*, was recently published by Putnam, says that LOGO may be a better language for boys because it is spatially-oriented. "From the available evidence in experimental psychology, there appear to be primary differences in spatial ability between males and females. Although no current data exists to evaluate this hypothesis directly, we've found no differences in the learning abilities of boys and girls in mastering BASIC, which is a serially-oriented language."

Both Galanter and Spencer praise the use of LOGO with very young children. "I think LOGO is an interesting experiment," says Spencer. "In a few years we'll know whether it stands the test of time."

The other test is, of course, acceptance. And experts agree that children have taken to computers passionately and wholeheartedly, despite the shortcomings of current software.

with this generous tax deduction, it's just not something we want to do — but we don't want our competition to do it either,' " Jonas explains.

According to *Washington Post* columnist Jack Anderson, who blasted the bill, "The long-range benefits to Apple could dwarf even the immediate tax break. Not only would the company get paid for spare parts, improvements and maintenance for the 83,000 computers, it's 'donation' would effectively freeze competitors out of the market. And in addition to the obvious publicity advantages, the training of thousands of young people on Apple computers presumably would predispose them to that brand name when they could buy their own."

Apple Chairman Steven Jobs, in an appearance before the Subcommittee on Select Revenue Measures of the House Ways and Means Committee, disputed the "spurious issues" surrounding the bill. "Passage of this bill is in no sense a free ride for Apple," he said. "In fact, our program will be of substantial cost to our company, or any other that chooses to participate."

Speaking for Rep. Stark, John Jonas says, "We believe that Jobs is very sincere in his commitment. If Mr. Stark didn't feel that way, he wouldn't have sponsored the bill."

Meanwhile, the California legislature made a move which guaranteed that — one way or another — children in that state will become computer beneficiaries. "They were pretty shrewd about the whole thing," says Jonas. "California has a unitary tax system, which means that corporations are taxed not only on their California earnings, but on their worldwide earnings — corporate taxes are substantial. Basically, what they've provided computer companies that donate equipment to schools in that state is a 25 percent tax credit against California state taxes. They made the California legislation conditional on the federal ligislation not passing. As it stands now, Apple, which is located in California, may go ahead and give every California school at least one computer.

"You'll probably see a lot more equipment in California schools this year, and California kids will have a headstart in computer education," Jonas adds.

Whether the Computer Equipment Contribution Act will pass in 1983 is anyone's guess. But, regardless of the outcome, efforts to increase the number of computers in the schools will continue. Few dispute the value of computers as the potential "fourth R" in educating the young, though finding the means to finance that end will probably continue to be a volatile political issue.

"Computers in education," says ICEE President David Moursund, "are here to stay. Not as mechanized conveyor belts of knowledge, but as general-purpose tools that help children learn — and prepare them for the sophisticated technology of the future."

—C. H. G.

WHAT (SOME) KIDS THINK ABOUT COMPUTERS

"It works great," says Nikki without a moment's hesitation. Ginny, fighting shyness, reports quietly that there have been a few glitches. "Nikki and I worked together on this one program to make up a picture of a unicorn, but it didn't turn out," she admits.

To the students in Ruth Gingrich's class at Wickcliffe Elementary School in Upper Arlington, Ohio, the 15 minutes a day each spends on the computer is their most "fun thing" to do. Mrs. Gingrich, who has used a computer with her classes for about four years, says that the machine teaches her students to think logically and has improved their math and reading skills. Equally important, says this learning disabilities teacher who works with students needing extra academic help, is what computers have done to the students' self-esteem.

"It's been greater than I ever thought it would be," she says happily. "Mastering it really improved their confidence. One student I had a couple of years ago was a real behavior problem. When he got into computers, he really cleaned up his act — and got the good citizen award the next school year."

Most of her students glow with confidence and enthusiasm. They want to demonstrate their programs, show their books ("Our teacher got us 'Fun with Computers' for Christmas") and talk — all at once — about what they like about computers. Of the dozen students in her one o'clock class, ranging in age from seven to 13, every one claims to want a future in computers. "They're about as smart as people," claims Aaron, who says he wants to be a pilot and use computers in radar bombing.

His classmates, apparently a more peace-loving lot, plan more mundane (and less dangerous) careers. Vince, an earnest, blond boy of 13, points out that it's smart to go into computers because that's where the jobs will be. Ten-year-old Mike agrees. "We might be paid more if we go into computers," he says hopefully.

But naturally, the future seems a long way off to these children, too young and honest to force an interest in something just because it might benefit them ten years from now. These kids are hooked — not because computers are good for them — but simply because they make learning fun. Oh, a few had some misgivings at first — "I was afraid that I might flop out," admits Aaron, the future bombardier. But mostly they embraced it like a knowledgeable and benevolent mechanical teacher. "I thought it was fun right from the start," says Vince. Tommy chimes in, "The computer helps me learn a lot — and I'm not afraid of that." His classmates laugh in a friendly way

But learning with the computer makes failure a meaningless term, says their teacher. "Mistakes just disappear," says Mrs. Gingrich. "Students try until they get it right. There are no big holes in paper from erasures."

Mrs. Gingrich started the class with canned programs but soon moved on to teaching them to develop their own. "Now I find, given a choice, they prefer to do it themselves."

In addition to the computer in Mrs. Gingrich's class, Wickcliffe has about a dozen more in a lab — and an Apple II in the library — which serve all students from kindergarten through sixth grade. Mrs. Badger, the librarian, and Mrs. Clark, the resource teacher who runs the lab, report the computers have been a big hit with almost all the students.

Adds Mrs. Badger: "And it's not necessarily the most intelligent children who are the most involved. It just appeals to some of them more."

Upper Arlington, an affluent suburb of Columbus, made computer literacy a system-wide goal in 1982 and teachers are enthusiastic about the in-service training they have received. Several at Wickcliffe have taken computer courses beyond those offered through the school system. Some, including resource teacher Daisy Clark, have bought home computers. "It's very handy," she points out. "I can run the programs at home before I try them out with the students."

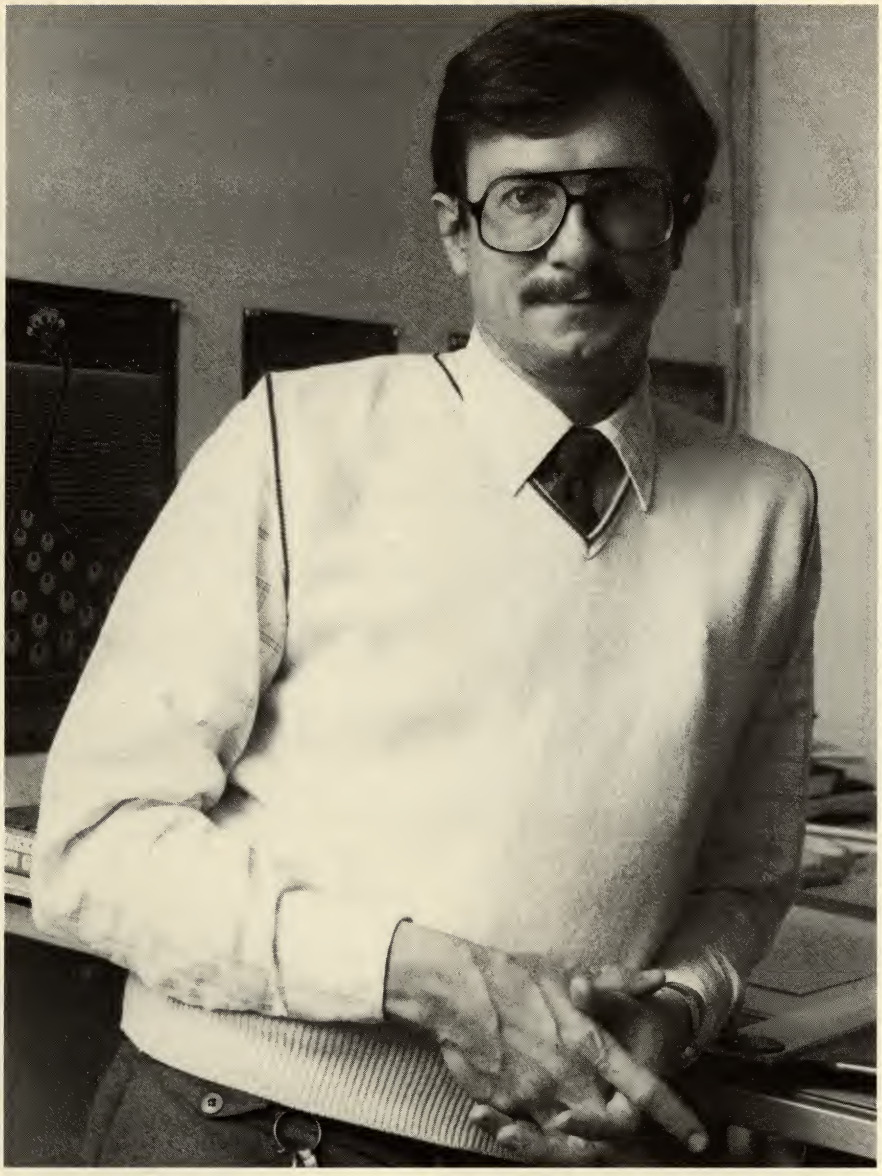
All Wickcliffe students come to the computer lab twice a week to work with Mrs. Clark and her trained volunteers, one of whom is a retired teacher. Younger children have 20 minute sessions while older students spend an entire class period, about 45 minutes. Mrs. Clark reports proudly on the keyboard mastery program developed for students by Mrs. Gingrich and two other Wickcliffe teachers that will be used system-wide to train children in the right fingering technique.

One can't help being impressed by these teachers' commitment to providing high quality computer instruction to their students. Mrs. Gingrich, Mrs. Clark and Mrs. Badger are seasoned professionals who've made long careers as educators in the traditionally-female elementary school systems — light years away, one might assume, from the mostly male high technology creators of the software and hardware they use.

But when Mrs. Clark begins waxing enthusiastic about introducing students to LOGO and Mrs. Badger talks about the introductory lessons for children on the library's Apple II, any doubt about who the real experts are is removed. For computers to be used effectively to teach all our Nikkis and Mikes, our Aarons and Ginnys, we must have the commitment of tens of thousands of teachers. A comment made by Ruth Gingrich is indicative of the zeal with which teachers in this central Ohio district have embraced the new technology. "Of all my teaching tools," she says, "if I had to choose to use just two I'd pick the chalkboard and the computer."

It's obvious that Wickcliffe students agree that machines are the best learning devices to come along in their young lives. Most of them expect computers to get smarter and smarter. In fact, 10-year-old Mike has something special in mind for his mechanical friend. "I want it to learn to do all my homework," he admits, as his classmates cheer.

Carole Houze Gerber is a contributing editor to TODAY Magazine



OSU's William Kolomyjec: "I can break the rules of nature. Artists do it all the time."

KOLOMYJEC:

An Artist Talks About Computer Graphics

William Kolomyjec, assistant professor of engineering graphics at Ohio State University, has more than 10 years of experience in computer graphics. Last fall he helped coordinate OSU's first computer art exhibition, at the Hoyt Sherman Gallery of Fine Arts in Columbus. The art was created by OSU's Graphics Research Group headed by Professor Charles Csuri, a pioneer in the field of computer-generated imagery. Kolomyjec, who has a master's degree in fine arts, recently spoke with TODAY writer Kathy Bissell about his views on computer art.

TODAY: Could you tell us about Ohio State's first computer art show?

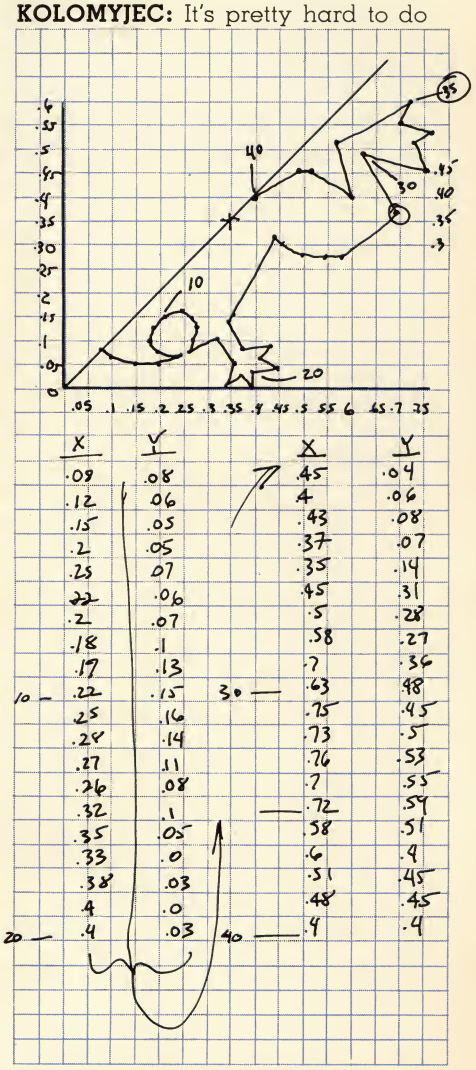
KOLOMYJEC: The show, "Computer OSU," which I had a part in organizing, wasn't really an art show. It was a showcase of what's being done with computers throughout the university —it was a view of the cutting edge of technology. Highly mathematical algorithms are used to achieve various effects. The show was a labor of love for me. I used it as an opportunity to go through the university getting people to come out of closets. I found out what's happening with computers. I flew an airplane with computer display. Moved the stick. It was fun seeing the everyday power of computer graphics.

TODAY: How does your art differ from the computer generated imagery exhibited by Professor Csuri at the "Computer OSU" exhibit?

KOLOMYJEC: The fundamentals of how they do it are pretty much the same as how I do mine, but their computer-generated images are built up using geometric shapes. It's just the output is different and the sophistication of the equipment and the cost of the equipment is much greater.

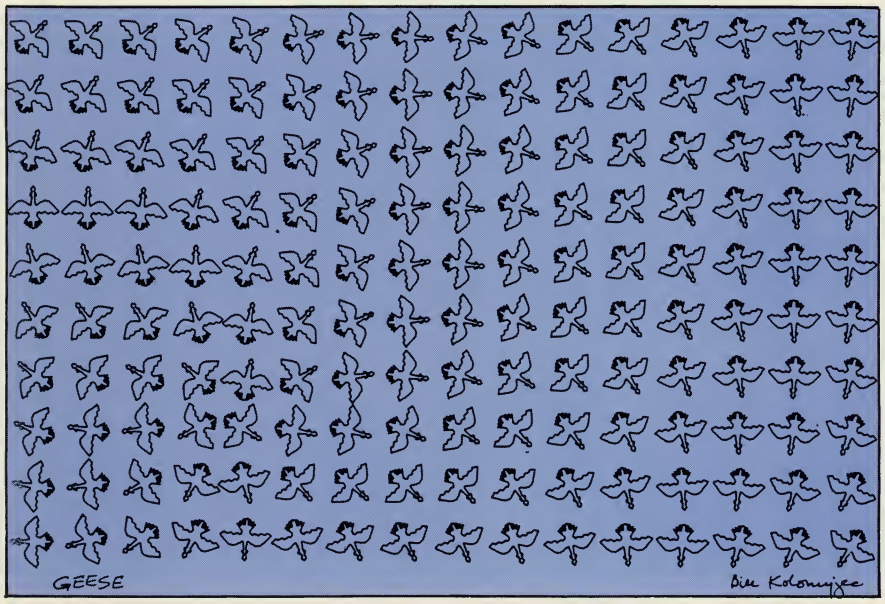
TODAY: Do you write programs in creating your art—or do you draw something and then figure out how to program it?

KOLOMYJEC: It's pretty hard to do



Creating "FROG:" Kolomyjec draws the image or part of the image on graph paper; identifies the x-y coordinates; inputs the coordinates and lets the computer create the second half of the symmetrical design; and finally he creates a pattern for the image to follow.

Kolomyjec creation "GEESE:" A world of fleeting images, fat cats and flying elephants



subjective programming, so I develop my ideas first. I get a general idea and then work at it until I get it right. Using what I call artistic programming, I then rewrite part of a program to make a sense of direction or to rewrite the shape of the creature. The creature is the data.

TODAY: Could this be done on a home computer?

KOLOMYJEC: Yes. I use an Apple II. First I draw an image or part of an image on graph paper. I then identify the coordinates on the graph paper that correspond to the desired design and to the computer screen. Then I input the coordinates and have the computer create the second half of the design. Finally, I create a pattern for the image to follow.

TODAY: Is this anything like needlepoint?

KOLOMYJEC: That's exactly right. In fact, I have a friend who uses a computer to generate needlepoint patterns. I've designed fat cats, flying elephants — and lots of sketches that never went anywhere or designs that didn't work.

TODAY: Which designs have you particularly liked?

KOLOMYJEC: I did a symbol for each of the seasons. Spring was a flower. It had more than 300 coordinates. Winter was a snowflake. After I did that one, some scientist came up to me and said 'You're stupid! A snowflake has only six points!' So I said, 'Haven't you heard of artistic license? I can break the rules of nature. Artists do that all the time.' But now I have a book on snowflakes — and they do, in fact, have six sides!

TODAY: How do you create dimensional art?

KOLOMYJEC: The computer can't draw curves. It draws a series of straight lines — line art is my specialty in the art field. But some designs have the illusion of dimension and since I'm a graphic designer, I know tricks of perception. Computer art plays a lot with perception and I think people need artistic training to do that effectively. Otherwise, computer art won't go beyond flashing, multicolored, kaleidoscopic stuff. A computer is a medium only. It's a tool. Just because you are doing images on a computer doesn't mean it's art, any more than just painting pictures does. I think computers are more suited to commercial art than to the fine arts.

TODAY: Is that criticism of computer art?

KOLOMYJEC: Most of the criticism of computer art — and it is well-founded, is that it lacks the sensitivity of most visual arts. Usually, that's because it's done by people not trained in art. There aren't too many artists who are trained on computers. The interesting thing is that many people in art disdain what the computer stands for. They're not good in math or science — they're more in tune with nature.

TODAY: What makes one computer-generated image better than another?

KOLOMYJEC: There's the question of originality. I do things with random numbers all the time. Using a random number generator, I can produce an infinite number of originals from the same program. Each would be an original in the true sense of the word — but are they art? When chance is involved, it's potentially art. But it's what the artist chooses that makes it art. It's my ability to see the random event that most appeals to me that makes it art — it comes back to craftsmanship.

TODAY: What are some of the technical problems you have making art with a computer?

KOLOMYJEC: When you're using recycled paper that turns brown in the sunlight to draw images on, they're not going to last. What always amazed me was all the money outfitting a computer can cost — yet the material put through it is so cheap! You've got a $15,000 plotter drawing on translucent 10-weight paper.

TODAY: Have you ever tried running other papers through?

KOLOMYJEC: I have some images I've done with liquid ink on very fine rag paper, but it's all off line. You have to have your own plotter, set up your way.

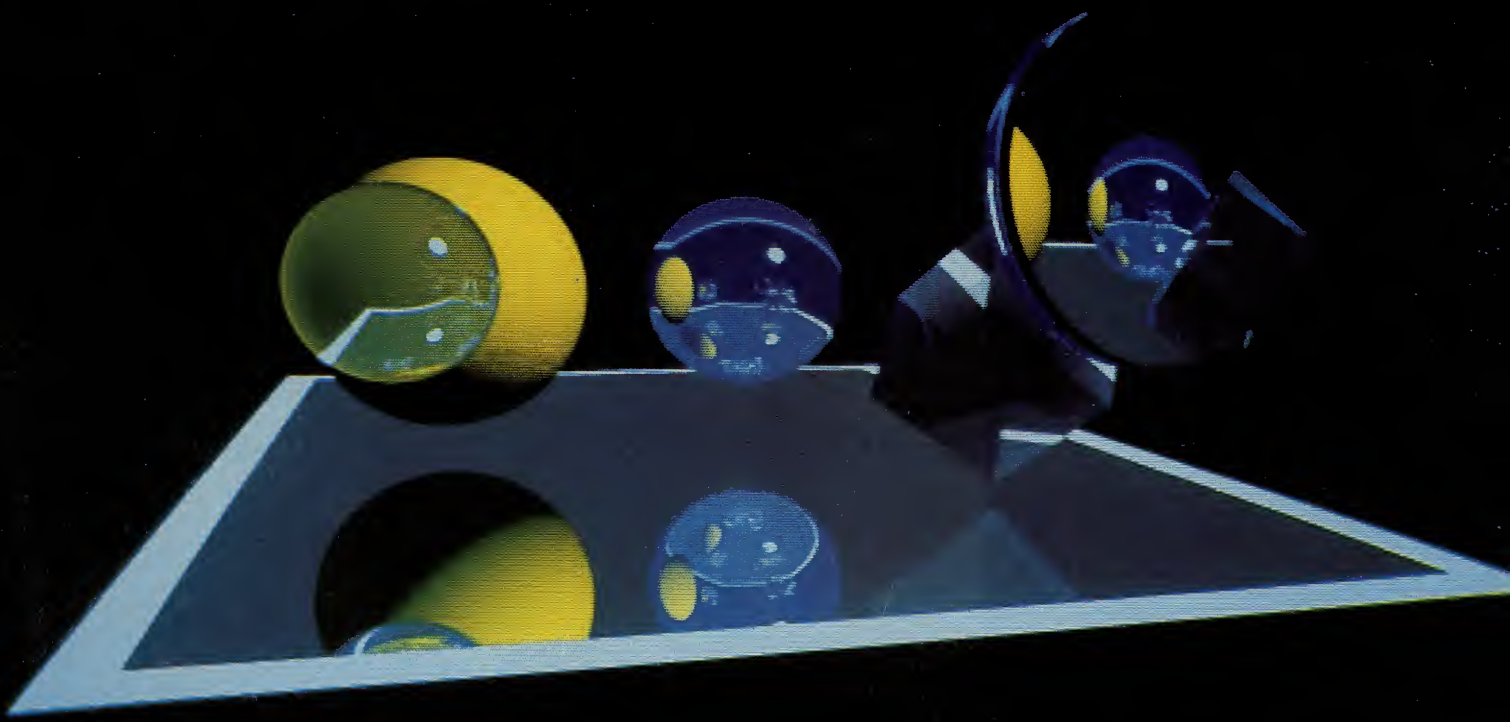
TODAY: What other interesting things have you been trying?

KOLOMYJEC: I've been drawing on the computer. The machine has to have great graphics capabilities. But there are some interesting things — one is what I call 'Saturday night software,' and it has no value beyond entertainment. You put a program into the machine and every time a different letter key is hit, you get a different program. And paddle buttons change the speed while other buttons change the color. You could knock a hole in the wall, put your monitor in it, project it up on the wall — and you've got something to do on Saturday night!

TODAY: What sorts of changes would you like to see in the computer art field?

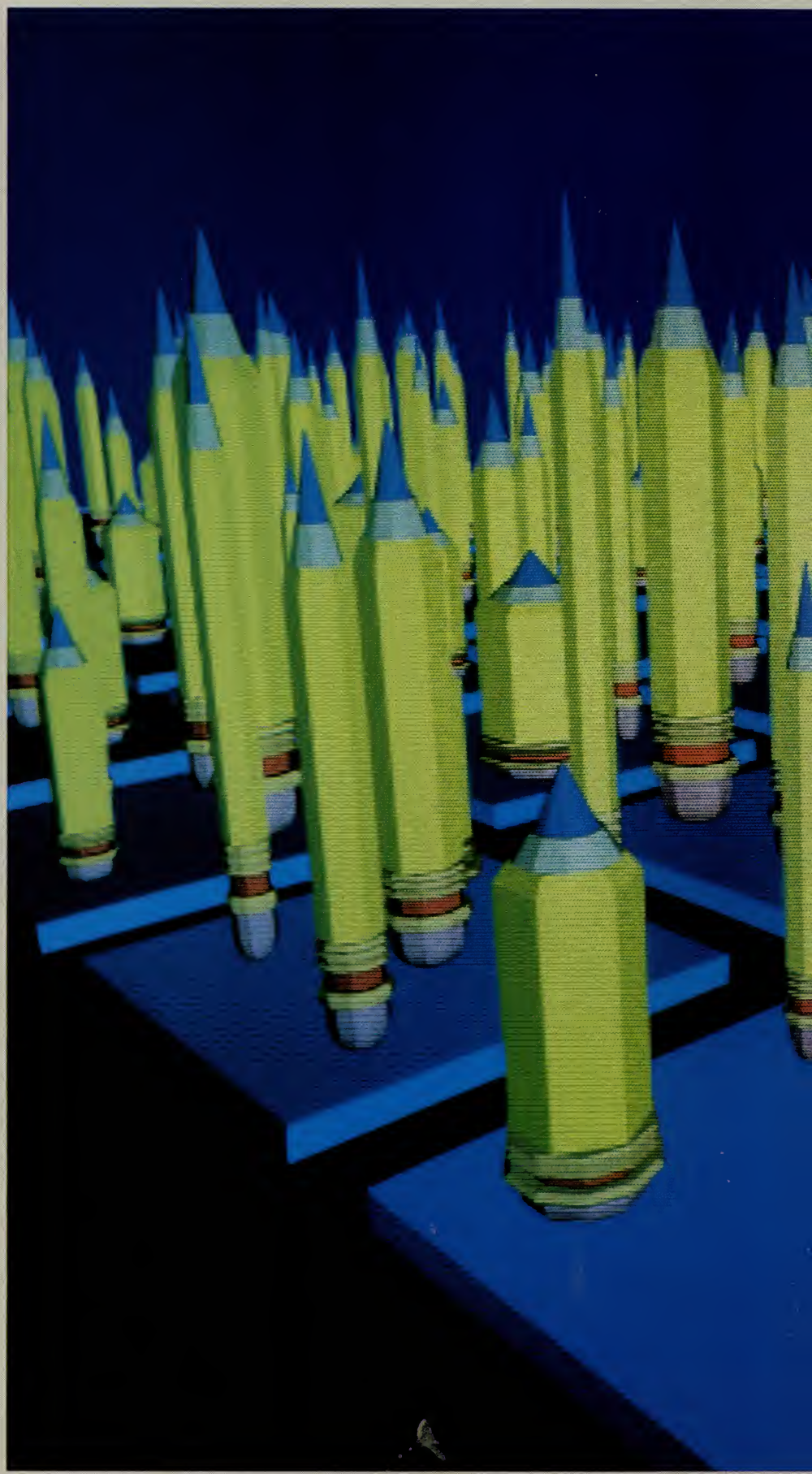
KOLOMYJEC: We've got to get the cost down! A lot of artists are starving and cannot afford the equipment. Also, art is to be consumed and a lot of people don't understand that. They think it's sacred. One thing that's missing in the arts is a way to tie them all together. To provide a forum that allows artists to communicate with each other. With computer art, software could be marketed — there are all kinds of things we could do.

COMPUTER OSU

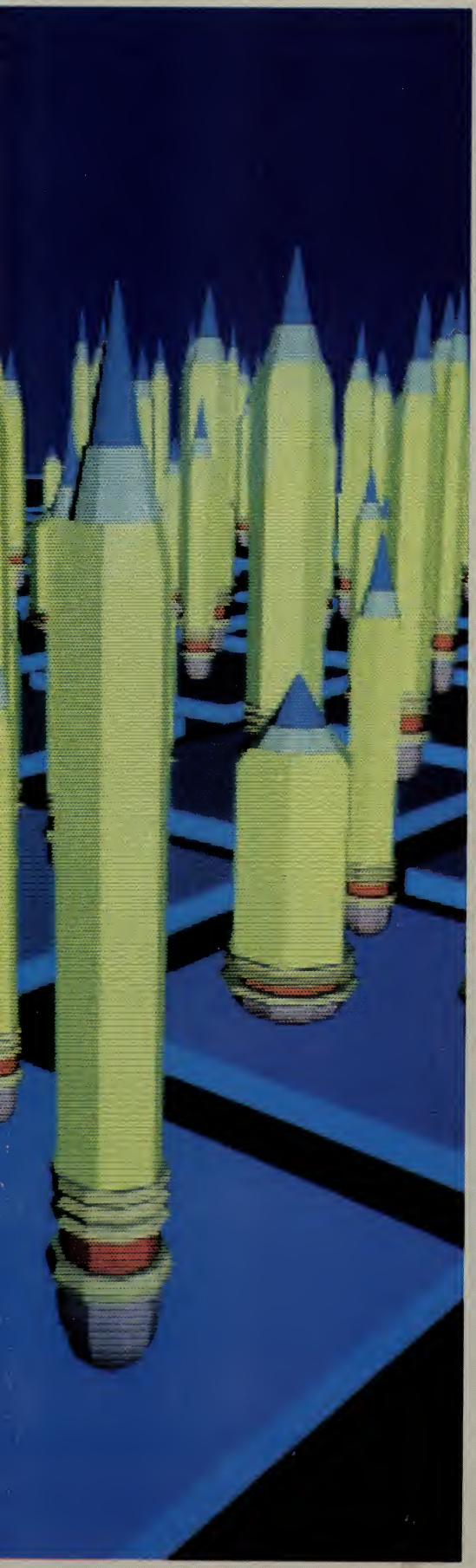


Computer Graphics at The Ohio State University

The Ohio State University and particularly its Computer Graphics Research Group, directed by Professor Charles Csuri, has been identified over the past decade as a major innovator in computer graphics and animation. A unique feature of Ohio State's efforts in computer graphics is that it is focused in the arts and education areas as well as in the sciences and technical disciplines. The identification of the Ohio State research environment as one in which artists, architects, educators, filmmakers, engineers, and computer scientists work and study in the area of computer graphics is well established. Recently the diversity of computer related activity at Ohio State has increased enormously. Computer projects have begun in cartography, astronomy, aviation, medicine, engineering and robotics. Such activity can also be found in economics, architecture, landscape architecture, art and science education, music, and industrial design. While many of these projects began for other than aesthetic ends, they often result in strong visual design. It is the visual excellence of these projects which prompted the exhibition of computer graphic programs and hardware at The Ohio State University's Hoyt Sherman Gallery of Fine Art in Columbus, Ohio: **Computer/OSU.**



cover
Transparent Spheres, Robert Connelly, The Computer Graphics Research Group



The term computer graphics is used to cover a wide variety of picture presentations that range from simple outline shapes to abstract forms to sophisticated, photographic-like images. It is the screen that provides for the most important interface between the computer and its user. Recent computer graphics offers the capacity for the viewer to instantaneously interact with and influence the presentation of a storehouse of data or information. Unlike film, which is frozen in a set sequence and order, computer graphics offers the possibility for data representation to be responsive to the viewer's commands for various orderings of its structure, surface qualities, and movements. And this reordering occurs almost instantaneously in the "real-time" world of the viewer.

The images reproduced here, represent a frame or a series of frames from the display programs and animations of the many different Ohio State computer groups. In the exhibition, itself, these programs appeared as moving and changing images on computer displays. Such programs indicate that both scientist and artist have realized the visual potential of the computer's video screen. They have begun to design programs that take advantage of the computer's enormous capacity for visual display. **Computer/OSU** indicates that the computer will have great significance for the future of the visual arts as well as for education and the sciences.

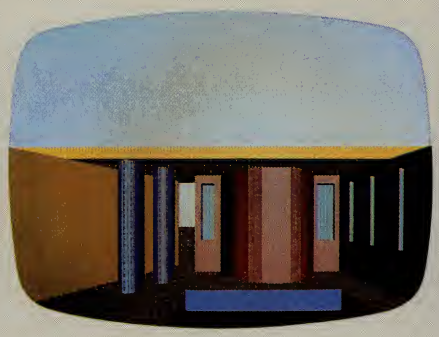
left
Pencil City, Michael Collery, Cranston/Csuri Productions, The Computer Graphics Research Group

above
Michael Collery, Cranston/Csuri Productions, The Computer Graphics Research Group

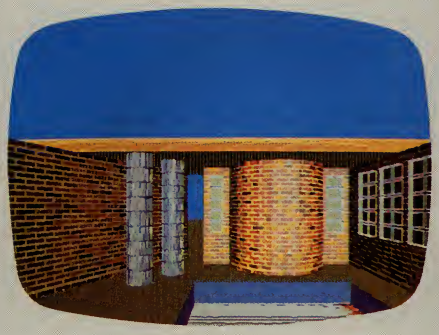
Computer Graphics In The Arts And Humanities

At Ohio State, the computer, primarily through its explosive development as a graphic device, has begun to revolutionize study and research in the humanities and the arts. The **DEPARTMENT OF ARCHITECTURE** has established a graduate program in computer-aided architectural design. This program is aimed at producing architects who, in addition to their professional level of architectural skills, are also capable of directing and managing the computer aided design facilities of a professional firm. At the department's Computer Aided Architectural Design Laboratory, known as **CAADLAB,** drafting systems that generate solid three dimensional color graphics with shading, texture, and shadows have been developed. Here an architectural rendering which would have taken days to draw manually may be produced by computer in hours or even minutes. The Department will soon take these programs into the studios, where light pens and terminals will take a place next to T-squares, pencils, and triangles.

The **DIGITAL SYNTHESIS STUDIO** is part of the sound synthesis facilities of the School of Music. It is one of the few large computer music facilities in the Midwest. The studio provides the means to create high quality digitally synthesized sound for use primarily by composers and researchers in psychoacoustics and music perception. Recently the Digital Synthesis Studio has begun to generate pictorial representations of musical forms on their computers.



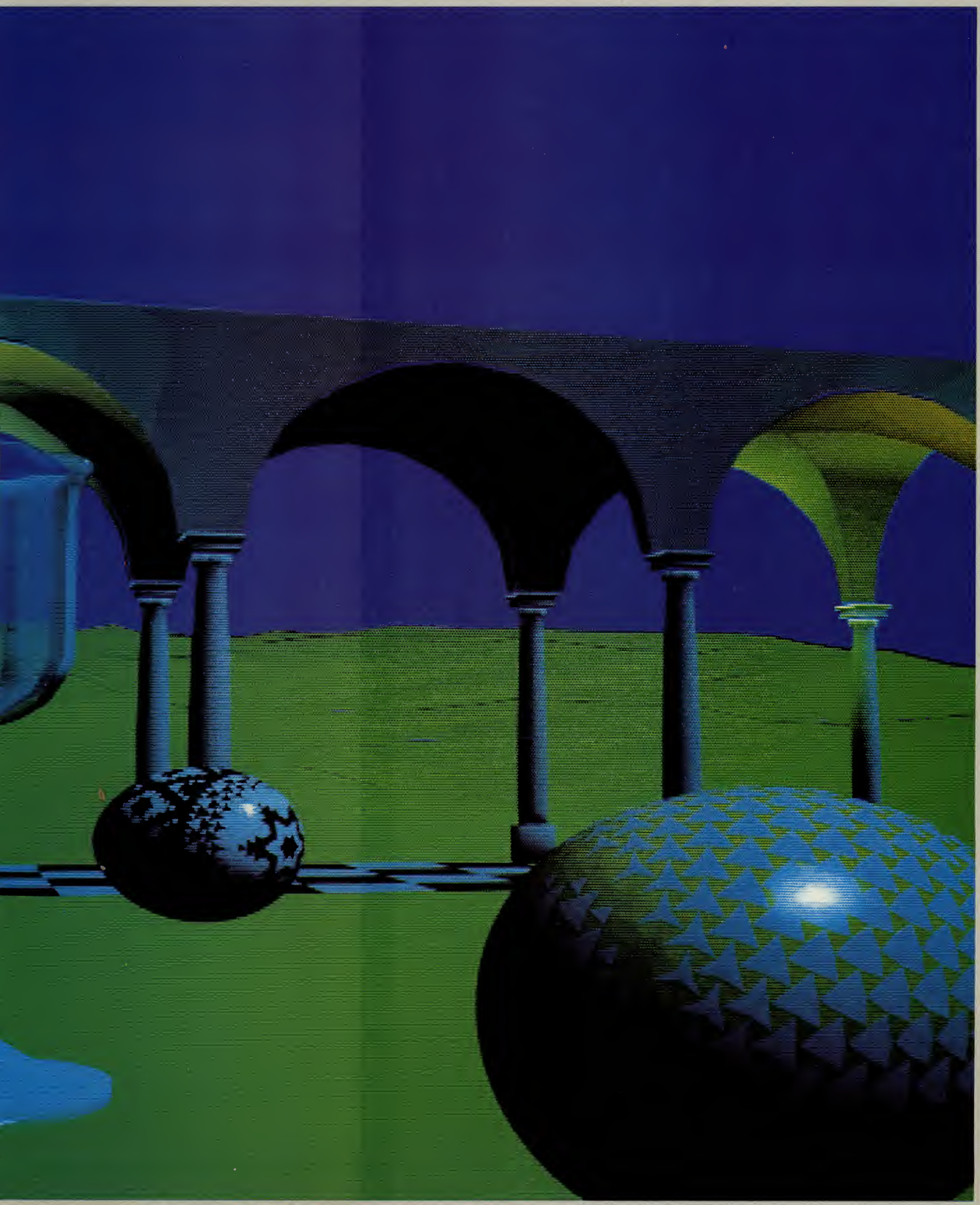
Conventional static maps usually depict information relating to phenomena at one point in time and according to a particular viewing point in space. The **DEPARTMENT OF GEOGRAPHY** has been using computer graphics to display the same phenomenon at different times, scales, and locations. Such com-



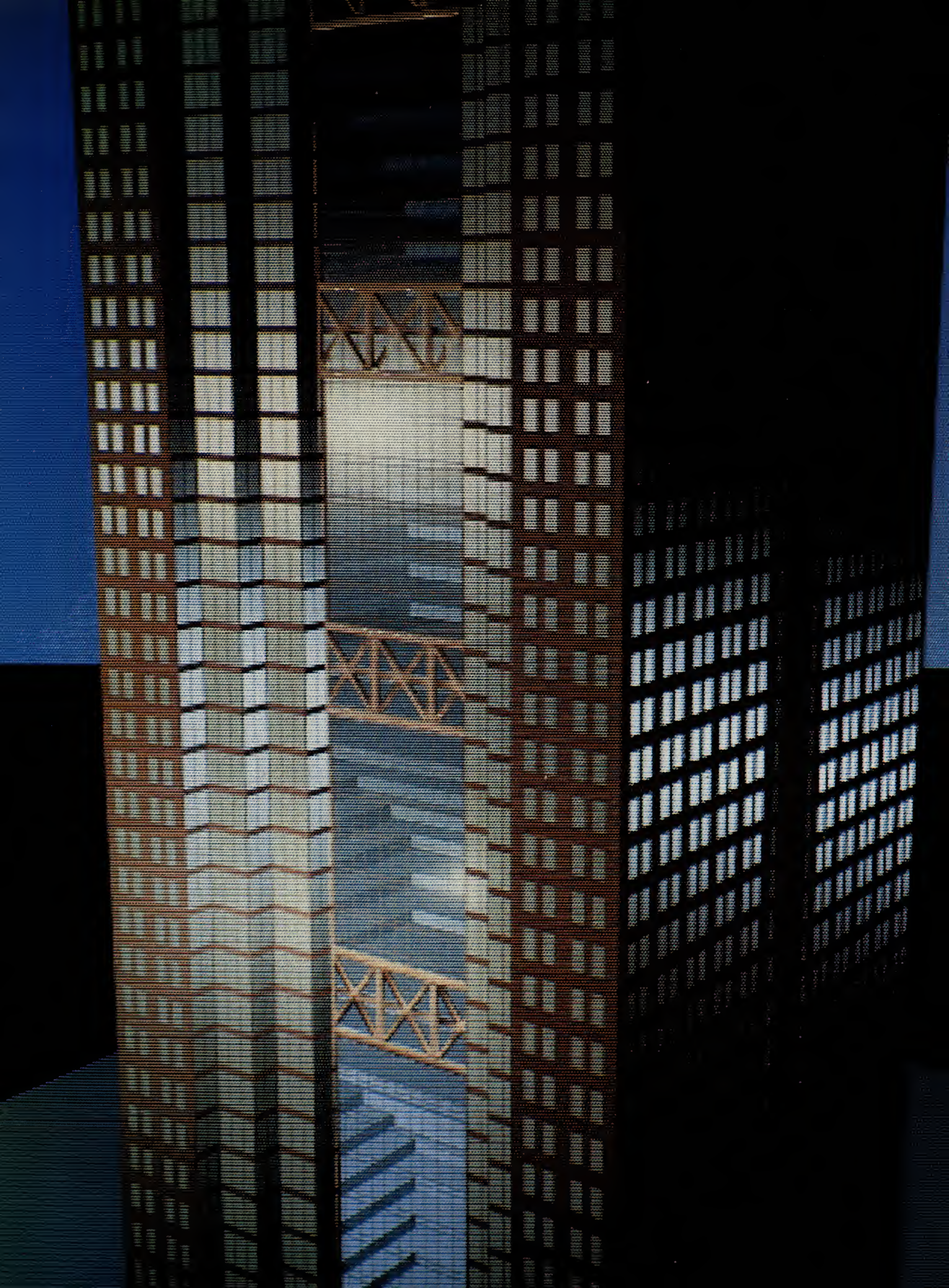
puter animations offer invaluable possibilities for formulating new hypotheses based on observed changes. Through such animations the inherent relationships between space and time, often difficult to discern from even a sequence of static maps, become evident and accessible.

above
Swimming Hole 1, Rich Nitzsche, Graduate Student, Department of Architecture & Student Work

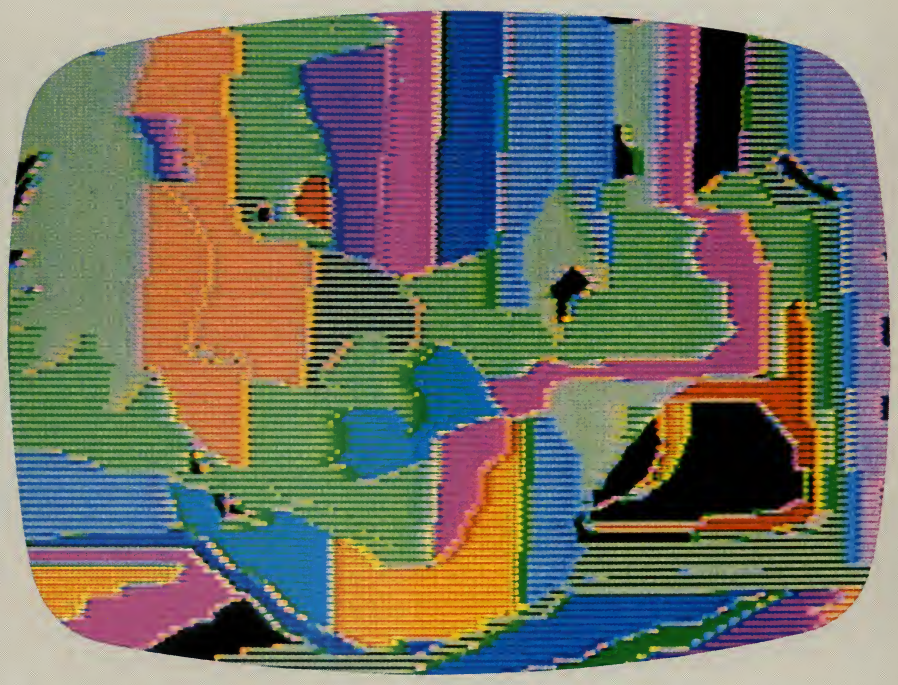
above, Franklin Crow, Department of Comp



uter & Information Science, The Computer Graphics Research Group



Computer Graphics As An Educational Aid



The use of computer graphics to help children learn mathematical concepts is one of the key elements of the **COLLEGE OF EDUCATION's** project: Technology and Basic Skills, known as TABS-Math. Instructional programs developed by TABS make use of Apple II and Atari microcomputers in elementary and secondary school settings. Some programs simply illustrate geometric processes; through animated graphics with correlated sound, the student becomes visually and aurally involved. In other programs students manipulate the graphic images; in so doing they can explore cause and effect relationships and study patterns of movements. Carefully constructed graphic programs can introduce concepts of relative rates, probabilities, and other phenomena, more directly than by means of abstract textual or numerical modes. The process of developing interesting and educational programs is challenging and complex. The TABS project hopes it will begin with an educational goal and will end with an enlightened student.

On a level which deals with more advanced students, the **DEPARTMENT OF ENGINEERING GRAPHICS** operates an Interactive Graphics Laboratory in which undergraduate students learn the fundamentals of contemporary computer graphic techniques. Using approximately 40 graphics terminals students gain experience with commercial computerized drafting systems, microcomputer graphics, and many specialized graphics programs.

The **DEPARTMENT OF LANDSCAPE ARCHITECTURE** has developed a computer assisted and computer managed instruction program for their course "Landscape Construction: Site Systems." The instruction programs deal with surveying operations, horizontal and vertical road alignment, and storm-water runoff. In each instructional area, the computer constantly creates new and different problem sets for each student. The computer checks the response for accuracy and gives tutorial feedback. For the Sophomore and Junior Design course the department is currently developing another instructional program with emphasis on topographical interpretation. Students are asked to identify landforms and sections, to locate problem areas, and to make decisions based on spacial, conceptual, and visual discrimination. Both these systems allow each student the opportunity for self-paced study. Students have full control of the sequence and type of problems during practice, while the program controls content selection during testing.

Landscape Architecture's programs run on a Magnavox Orion-60 plasma display system which uses a computer controlled, random-access, slide projector and touch-panel. The touch-panel allows students to answer questions directly by merely touching the computer's screen. The semi-transparent plasma display is used as a screen for the rear projected slides. The slides are overwritten by computer graphics and text which appears on the plasma display.

left
Huntington Bank, Michael Collery, Cranston/Csuri Productions, The Computer Graphics Research Group

above
Utility Program developed by TABS Project, College of Education

Computer Graphics In Scientific, Medical, And Engineering Research

The potentials of computer graphics have been extensively explored in a variety of scientific, medical and engineering research projects at Ohio State. Several of these projects are occurring in medical research and diagnosis. Through the sophisticated interconnection of computers and television cameras the Gait Laboratory of the **DEPARTMENT OF PHYSICAL MEDICINE** is able to clinically analyze the progression of several diseases such as juvenile rheumatoid arthritis and muscular dystrophy. The Gait Laboratory first gathers its information by monitoring human movements with a two camera video system which was developed by electrical, biomedical, and mechanical engineers. Additional data is gained by sophisticated electronic measuring apparatus and then analyzed and compared to dynamic biological models developed by the laboratory. Such parameters as joint angle, muscle firing pattern, and impact with the ground are analyzed. The analyzed data can then be displayed on a video screen in the form of actual animated movement. The laboratory in the future will be able to provide a wide medical community with visual data upon which to base diagnosis and treatment.

The **DEPARTMENT OF BIOMEDICAL ENGINEERING** is another medical unit which has used computer graphics. Help for the deaf to form normal speech patterns is provided by the colorful display of VOCOD-

ER, a Video Display of Voice Coding. With this program voice signatures of both normal speech and that of a deaf person can be observed side by side. Such visual inspection can help the deaf form words in a more understandable manner. The department also uses computer graphics in monitoring devices for anesthesia procedures and cardiac intensive care. A computerized ECG analysis system is being developed that will return a preliminary analysis to the bedside of even a remote hospital within 30 seconds.

The **DEPARTMENT OF ANESTHESIOLOGY** has developed its own Anesthesia Integrated Monitoring System, AIMS. The system provides information which is logically connected and easily comprehended. Numbers provide specific information while colored graphs show the history of the patient and the progress of the medical procedure. Three types of data display are available. Data Pages show patient information; Alarm Pages allow the anesthesiologist to set limits on all information; and Option Pages provide the ability to change the way the computer looks at patient information.

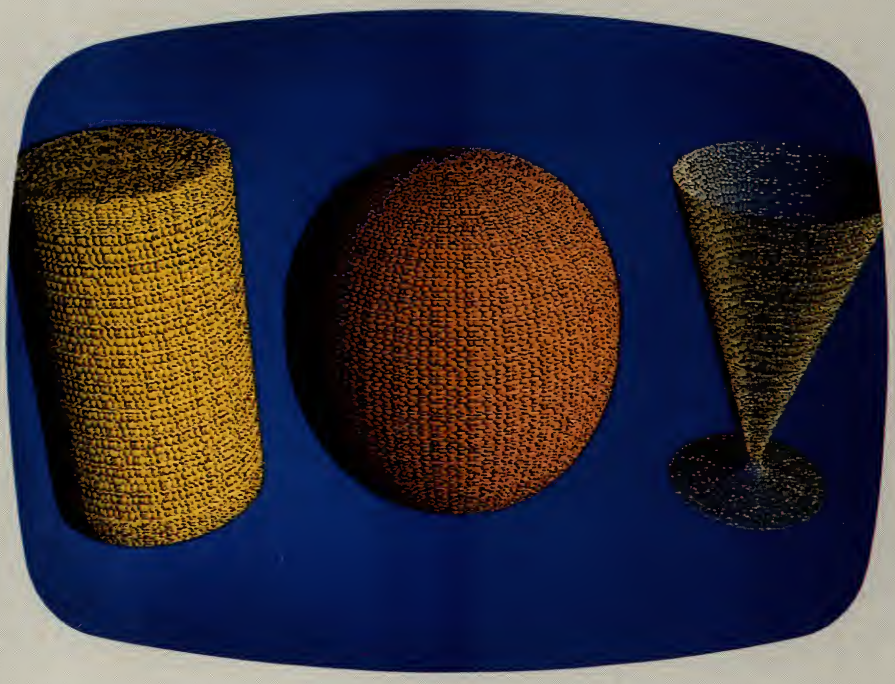
Two areas in Aviation are developing computer generated visual display systems. The **DEPARTMENT OF AVIATION** GAT-1 general aviation trainer is interfaced with a special purpose computer display. This system is capable of creating a scene comprising fields of various sizes and colors in different shades of green and brown, as well as a sky with a typical blue cast. The simulated air field consists of a single runway and a parallel taxiway with three turnoffs between runway and taxiway. It also includes runway markings and a

left
Jumping George, Donald Stredney, Cranston/Csuri Productions, David Seltzer, The Computer Graphics Research Group

textured asphalt colored top with a white center line and white numbers at the ends. Special effects include an infinite visibility control that can vary sky conditions from clear to zero visibility for instrument weather training. The visual system responds correctly to wind conditions. Being fixed to the floor, it is also possible to have a side window display when flying the base leg of the circuit.

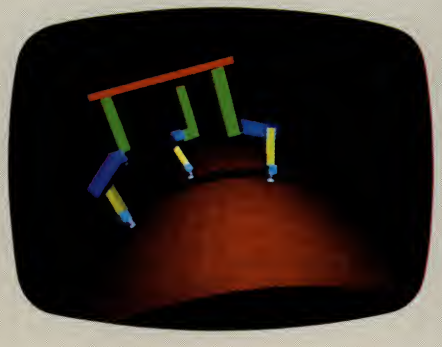
In the **DEPARTMENT OF AERONAUTICAL AND ASTRONAUTICAL ENGINEERING** computer graphics are used to display the results of airfoil and wing design analysis. Results from experiments are displayed in "real time" so that researchers can visualize the results of the experiments as they proceed. Interactive graphics are also used at the General Aviation Airfoil Design and Analysis Center operated at OSU. This national center, started with the sponsorship of NASA, supports the activities of the general aviation technical community in the design, analysis, testing and production of business aircraft.

Over the last ten years, there has been a rapid increase in the use of computer graphics in the industrial areas of the United States. The cost-effectiveness of this tool is obvious in the drafting and machine design areas. The Advanced Design Methods Laboratory, known as ADML, of the **DEPARTMENT OF MECHANICAL ENGINEERING** uses its facilities to explore with the aid of computer graphics problems of linkage analyses, interactive curve fitting, machine element design, and turbomachinery analyses.



The Digital Systems Laboratory of the **DEPARTMENT OF ELECTRICAL ENGINEERING** has been actively utilizing computer graphics for the design and simulation of robotic systems. Much can be learned about the potential usefulness of new robotic designs by simulating their movements and activities by computer graphics. The laboratory is now involved in the conception and development of an outer-space assembly vehicle to be used in constructing large outer-space structures. With the aid of computer graphics, the lab is also modelling human locomotion and developing robotic systems with kinematically redundant, manipulator arms.

The simulation of human walking is an important activity of this lab for it is anticipated that studying human skeletal movement will give insight into physical principles which could be applied to artificial systems. The construction of an animated human figure involved in walking or running has traditionally required a painstaking frame-by-frame description of each link of the body. Even with the best efforts, the results have often looked like cartoons. Now, however, researchers from this laboratory have developed mathematical algorithms which automatically coordinate all of the linkages of the human body for walking and stairclimbing. The animator is now freed from the tedium of specifying minute details of each body link and may concentrate on the higher level activities of his animated figure.



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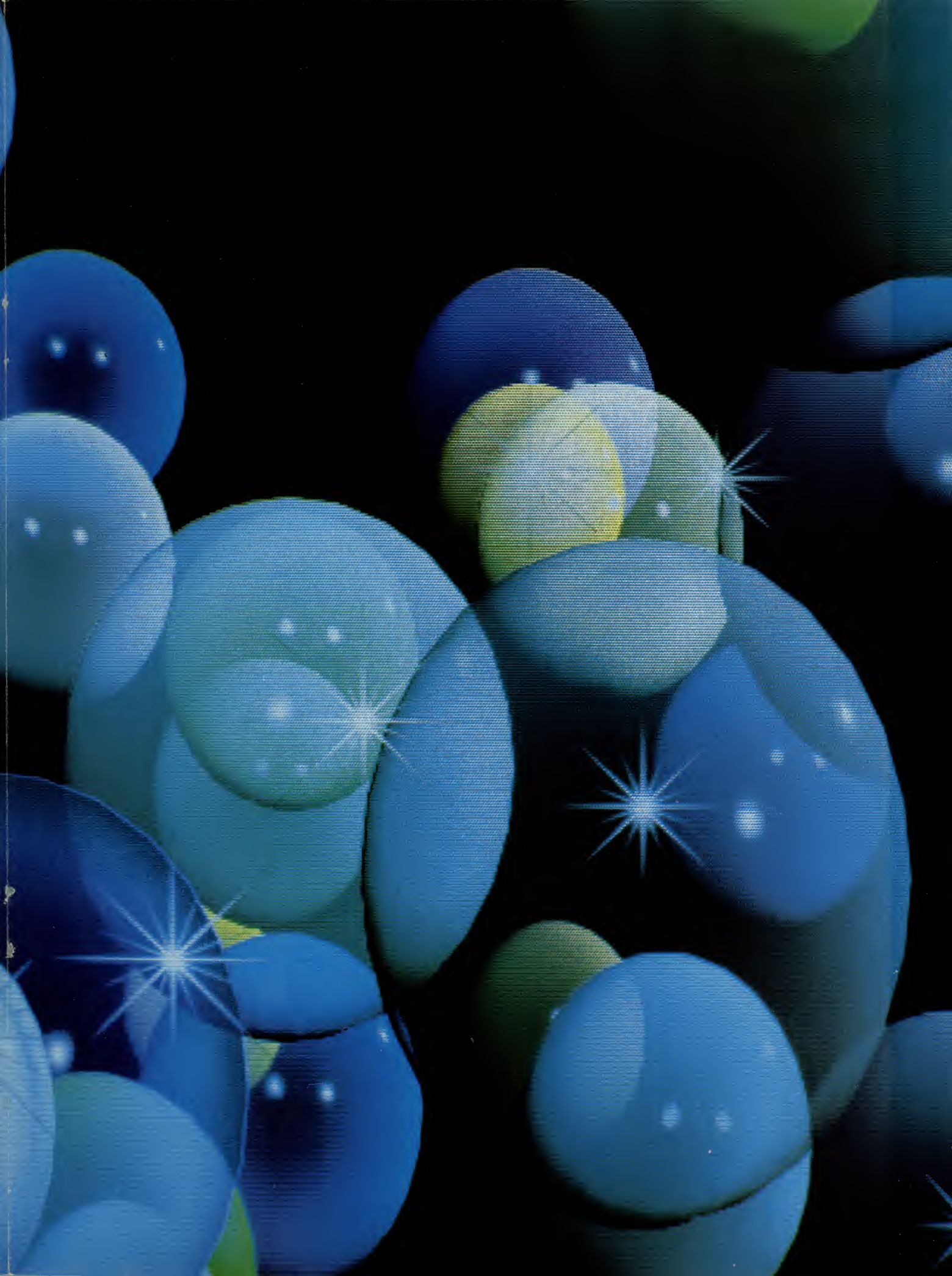
Simulation of Space Assembly Vehicle, Chuck Klein & Mark Patterson, Department of Electrical Engineering

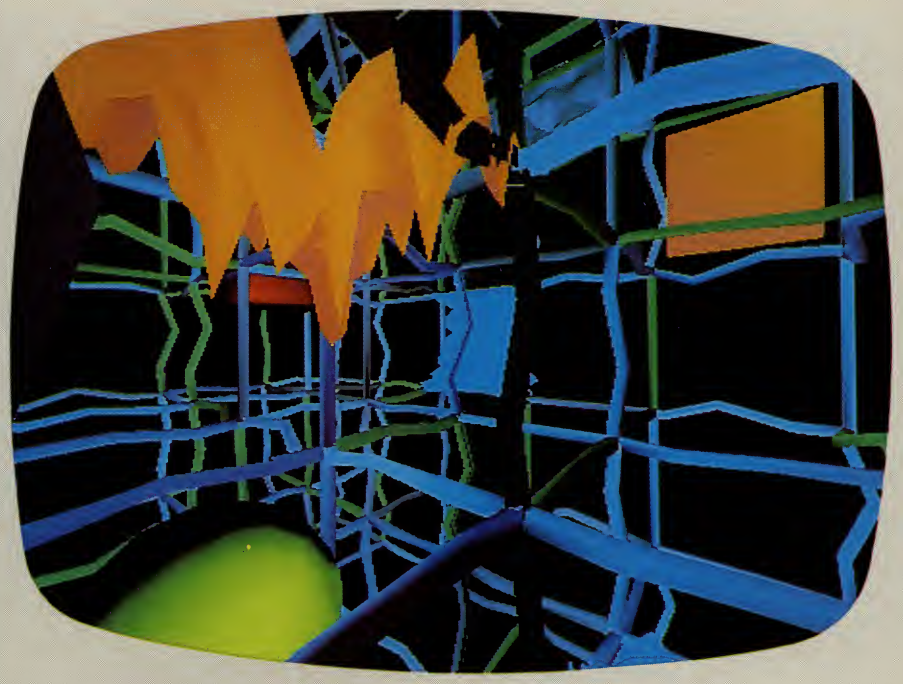
above, right
Michael Collery, Cranston/Csuri Productions, The Computer Graphics Research Group



Research In Computer Graphics

The presence of so much computer graphic activity at Ohio State has been nurtured by ongoing research into the nature of computer graphics itself. The **COMPUTER GRAPHICS RESEARCH GROUP,** known as **CGRG,** under the direction of Professor Charles Csuri, is an interdisciplinary, interdepartmental organization with faculty drawn from the departments of Art Education, Computer and Information Science, Electrical Engineering, Biophysics, and Education. CGRG's research represents the state of the art in computer graphics and animation.

Professor Csuri recently stated the basic goals of his group. "CGRG is committed to furthering the state of the art in computer-aided visual expression. This application provides a focus for a wide range of endeavors under the umbrella of computer graphics. In order to make understandable images, research into high-quality display algorithms is necessary. In order to provide a numerical description of the collection of shapes which make up a scene, research into numerical description of surfaces is pursued. In order to produce a scene to match a human conception, research into interactive computer-aided shape design is needed. To create animated sequences of images, many aids to motion description are required ranging from additional interactive techniques to small languages for motion description. Finally, the design and implementation of special-purpose hardware for aiding image production is a necessary line of research without which many animation techniques would be rendered impractically slow."



The **DEPARTMENT OF COMPUTER AND INFORMATION SCIENCES** provides most of the technical base to support the basic research activities of the Computer Graphics Research Group. Its own sequence of courses in computer graphics and image synthesis leads to degrees on the Masters and Doctorate level in computer science.

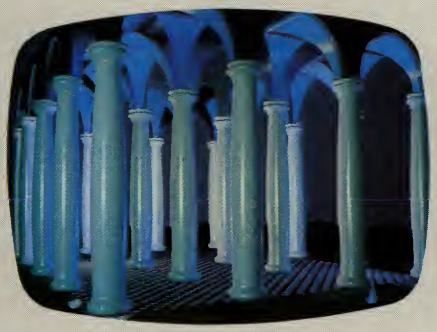
left
Rick Balabuck, The Computer Graphics Research Group

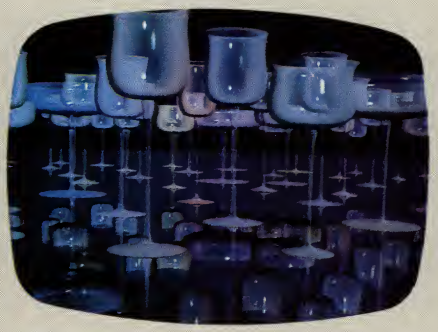
upper screen
Rick Balabuck, Department of Art Education, The Computer Graphics Research Group

lower screen
Animation Segments, José Garabis, Department of Art Education

COMPUTER/OSU

The **DEPARTMENT OF ART EDUCATION** also offers a specialization in computer graphics and animation in which graduate students can work toward Masters and Doctorate degrees studying with the faculty and using the facilities of the Computer Graphics Research Group. Students in this program are required to extend their study through additional course work in Computer and Information Science, Architecture, Engineering Graphics, Photography and Cinema, and Educational Technology. The Department's program permits entrance to a high technology field through the arts and education. It provides both research and instructional opportunities for faculty and students interested in aesthetic and educational applications. The department's commitment to this integration of art and technology has attracted national and international attention.





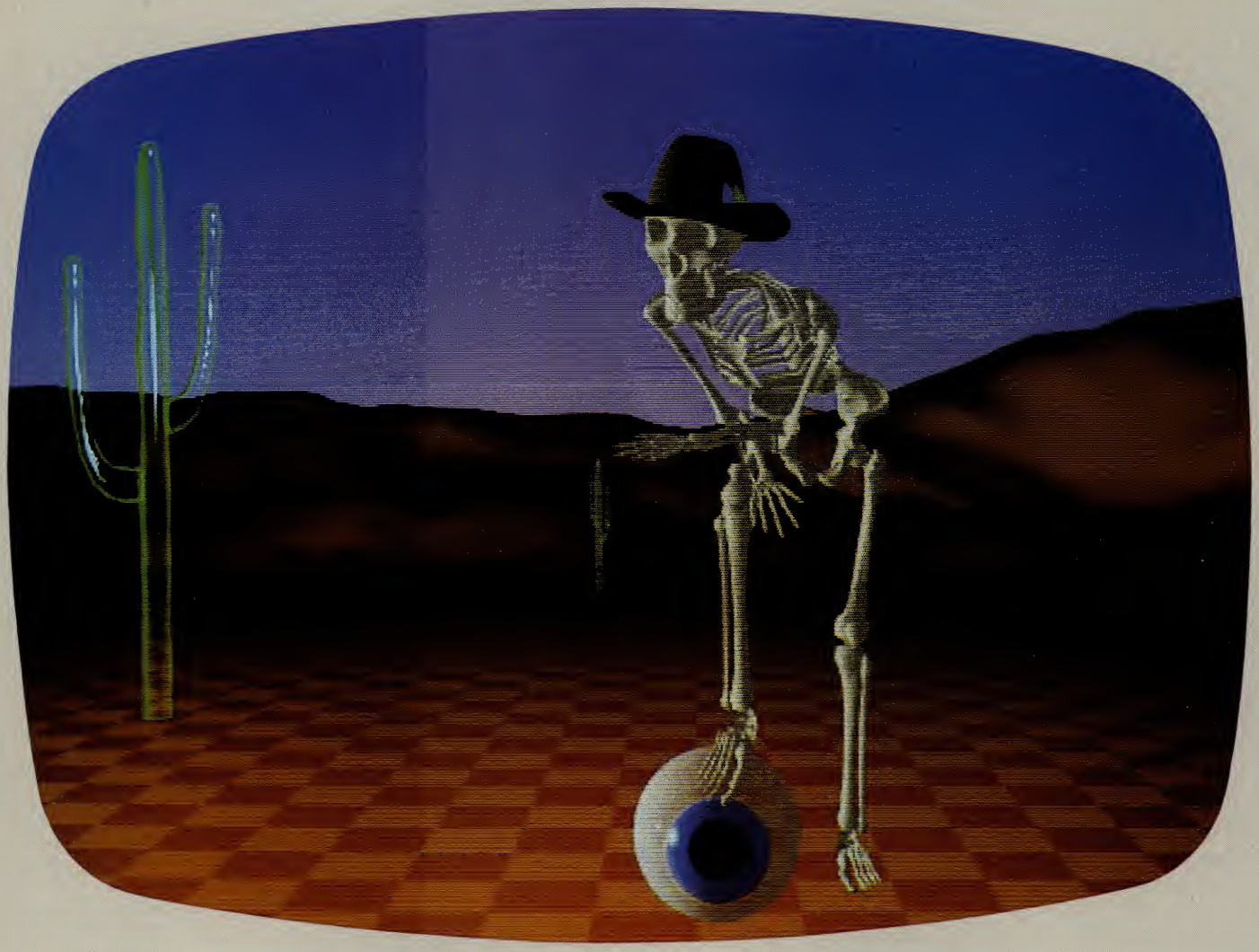
upper screen
Michael Collery, Cranston/Csuri Productions, The Computer Graphics Research Group

left
Shadow Routine, Hsuen-Chung Ho, The Computer Graphics Research Group

lower right screen
Stephen Frazer, Department of Art Education

lower left screen
Rick Balabuck, Department of Art Education, The Computer Graphics Research Group

COMPUTER/OSU



The exhibition **Computer/OSU** took place on October 28th to November 14, 1982 at The Ohio State University. The Exhibition Coordinators were:

Thomas E. Linehan, Assistant Professor, Art Education and Associate Director, The Computer Graphics Research Group.

Jonathan Green, Director, University Gallery, and Associate Professor, Photography and Cinema.

Assistance was provided by William Kolomyjec, Assistant Professor, Engineering Graphics; Kevin Keiser, graduate designer; Brenda Kurlansik was the graduate curator of the exhibition.

Jon Cunnyngham, Professor, Economics

Suzanne Damarin, Assistant Professor, Science and Mathematics Education, and Director, TABS-Math

Jonathan Green, Director, University Gallery, and Associate Professor, Photography and Cinema

William Kolomyjec, Assistant Professor, Engineering Graphics

Thomas E. Linehan, Assistant Professor, Art Education, and Associate Director, The Computer Graphics Research Group

Harold Moellering, Associate Professor, Geography

Stephen Sperry, Assistant Professor, Landscape Architecture

Thomas Wells, Assistant Professor, Music

Christos Yessios, Associate Professor, Architecture

The Exhibition Advisory Panel consisted of:
George Baughman, Director, OSU Special Projects

John Belland, Associate Professor, Educational Foundations and Research

Charles Csuri, Professor, Art Education, and Computer and Information Science, and Director, The Computer Graphics Research Group

above *George Out West,* Donald Stredney, Cranston/Csuri Productions, David Steltzer,

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A.
D.
C.
E.
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BID YOUR FINGERS FOLLOW YOUR COMMANDS AND I WILL BE YOUR EYES AND HANDS.
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A. T-shirts: Available in adult (small, medium, large, extra large) and childrens' (small, medium, large) sizes; cotton/polyester blend. Colors: light blue, kelly green, red, tan, yellow, and black. Cost $8.95.

B. Adventure 350 Map: Conducts players through adventure game maze; not guaranteed to bring success in video version. Black-ink-on-white-paper. Size 17″ x 25″. Cost $2.95.

C. Adventure 751 Map: Advanced version for Adventure aficionados; size 23″ x 35″. Black-ink-on-parchment. Cost $4.98.

D. Full-color poster: Provides Adventure inspiration to even the most travel-weary explorers. Size 18″ x 24″. Cost $5.95.

E. Full-color Puzzle: Features 500 interlocking pieces depicting an Adventure game confrontation between explorers and fiery dragon. Finished puzzle size is 16″ x 20″. Cost $8.95.

F. MegaWars full-color poster: A splendid souvenir for battle-hardened Colonists and Kryons alike. Large 24″ x 38″ "Crush the Kryon Empire" poster. Cost $5.95.

F.

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TAXES: MAKING THE MOST OF COMPUTER-RELATED DEDUCTIONS

by Kathy Baird

The typical user may look upon his computer as the greatest thing since the silicon chip. But as far as the IRS is concerned, says CPA Dean Adams, a tax specialist and partner at Price Waterhouse, it's just another office machine.

"In terms of tax laws, a computer is just like a desk, a typewriter or a press in a factory," says Adams. "For home users, it's still too early to predict what future IRS rulings might be. Big sales of home computers have been a phenomenon of only the past two or three years and those returns haven't come up in an examination cycle yet so present laws haven't been challenged."

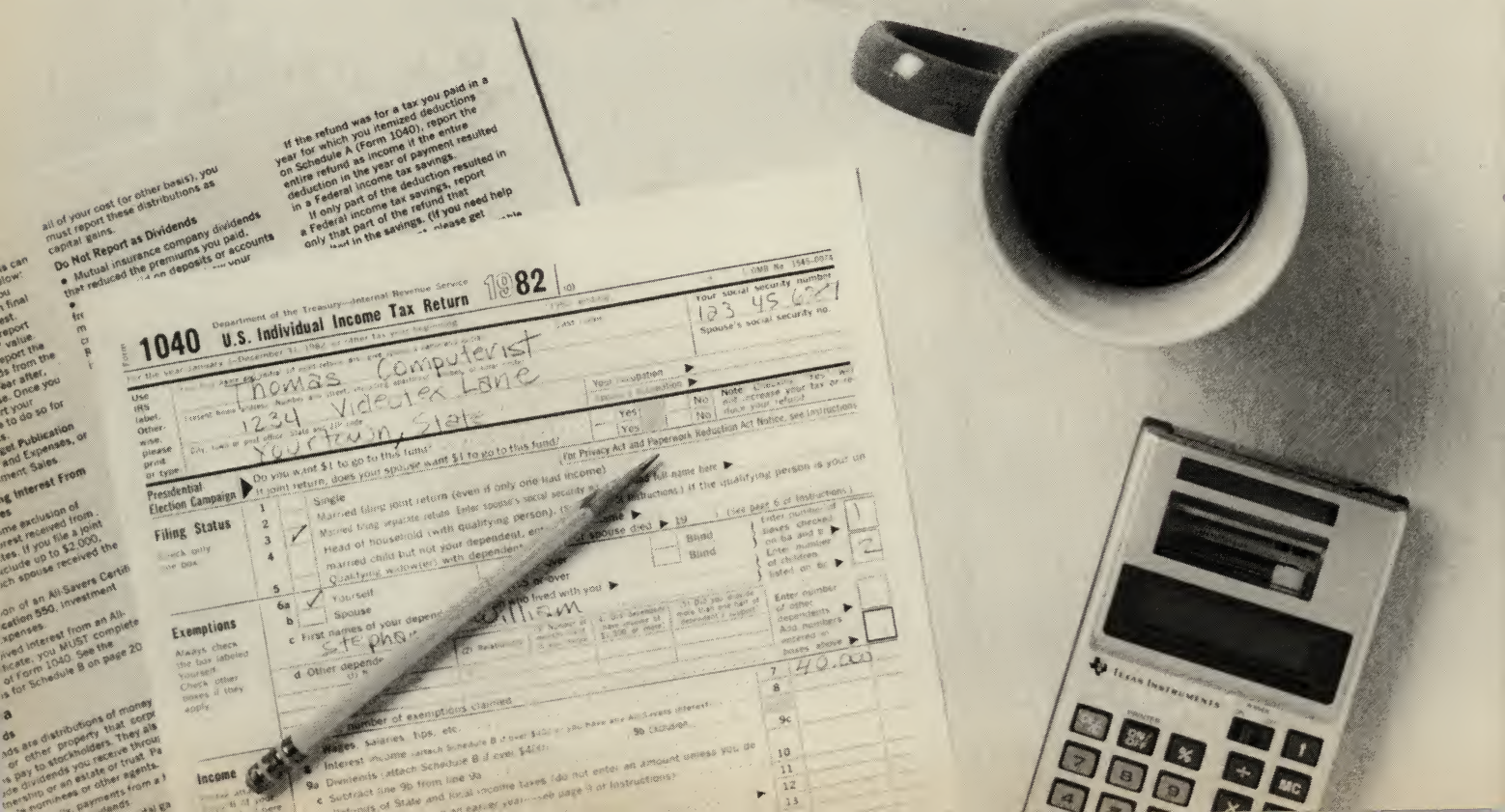
Presently, a portion of the purchase price of hardware and software for business purposes is deductible. So is the cost of connect time on a videotex service. A stockbroker, for example, who uses any of the videotex services to check stock quotes, review business papers or look into other stock-related information may deduct the cost of database services. So may large investors and some small business owners.

IRS Taxpayer Service Specialist Mary Alston says that those investors claiming only small dividends would probably not be allowed a deduction for use of database financial services. As with hardware and software, connect time must be used in relation to an income-producing activity. Home hobbyists belonging to tax investment clubs dealing in small sums probably would be denied a deduction.

According to the Internal Revenue Service's handbook for taxpayers, activities used to produce or collect income or to manage income-producing property are tax deductible, as are "ordinary and necessary" business expenses. In filing returns, these types of expenses are usually claimed as business deductions by the self-employed, while employees normally make claim under miscellaneous itemized deductions as employee business expenses. Large investors claim the deductions as investment expenses.

Alston warns that, in general, expenses incurred in the investigation of new business or investment opportunities are not deductible. However, according to Tom Doktor, manager of Tax Training for H&R Block, expenses of unsuccessful attempts to acquire a specific business or investment are deductible as long as the intent was to make a profit.

As with all tax deductions, careful records must substantiate claims. Users should retain all usage records from videotex services showing the dates, times and charges. The three major videotex services — CompuServe, The Source and Dow Jones — all offer users service records on line for recent use. For a printout of records going back more than several weeks, contact the customer service departments of the various services. Because the system has no way of knowing whether business or recreational purposes are being served, it's up to individual users to keep careful documentation. Alston says the IRS



requires a log including separate lists of the times various services were used for both business and personal purposes. She advises those using videotex services for business-related electronic banking or mail to keep hard copies of these transactions in addition to log entries.

Those taking advantage of videotex services offering specialized information to professionals, such as CompuServe's Special Interest Groups (SIGS) may take a deduction as long as the exchange of information is business-related. Alston says that SIGs are deductible even if occasional social comments are made by members, as long as the social exchange is not the overriding part of the communication. SIG participation falls into the same category as business phone calls and business letters. Here again, a careful log of time and purpose must be kept.

Those using a videotex service while learning a job-related computer programming language may claim a deduction for connect time, much as those in less technical fields may deduct the cost of professional books. Connect time cannot be deducted as an educational expense, however, if it is being used to train for a new trade or business.

And while no present tax regulations deal expressly with computers, Section 212(3) of the Internal Revenue Code states that "Expenses paid or incurred by any individual in connection with the determination, collection or refund of any tax are deductible." Therefore, the cost of hardware, software or other computer services used to keep tax records or to prepare personal tax returns are deductible.

Home computer owners using their machines for tax preparation or business or investments may deduct a portion of the purchase price of their hardware. To determine the amount of the purchase price that is deductible, use of the computer for personal and for business purposes must be allocated. This may be done on the basis of time spent using the computer for each purpose, or on other criteria such as number and complexity of programs developed or used for each purpose. Fifty percent of the purchase price may be deducted if half of computer use is business-related.

The deduction may be claimed in several ways. For simplicity, owners of computers costing less than $300 should claim a one-time business deduction. A deduction for computers costing between $300 and $5,000 may be claimed either as a one-time expense on a single year's tax return, or it can be depreciated over a five-year period. Those choosing the depreciation option may also take an immediate, one-time 10 percent investment tax credit on the cost of the computer.

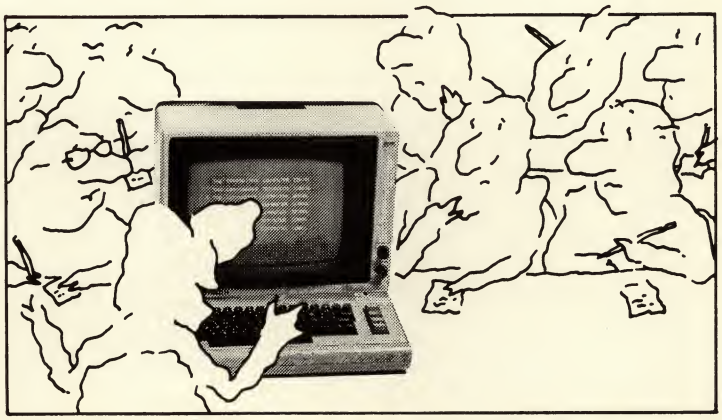
Software used for business, tax or investment purposes may be claimed as a one-time business expense, or — more typically — according to CPA Dean Adams, capitalized and depreciated over five years. Tax Specialist Alston warns that the IRS is concerned with abuse of the software deduction as a fraudulent business claim of those using it for recreation.

Doktor advises taxpayers not to shrink from making legitimate computer-related deductions simply because the IRS claims to scrutinize them carefully. "If you're not sure about whether a deduction is allowable, check with your tax advisor," he says. "You can also get a letter ruling from the IRS before filing the return. The IRS also has a toll-free number, 1-800-424-1040, to handle questions."

Americans have known for a couple of centuries that, as far as the IRS is concerned, an honest face simply isn't enough. Users who keep accurate records and make computer-related claims relevant to their occupations should have an easy time with the Internal Revenue Service in 1983.

Kathy Baird is a free-lance writer from Columbus.

Tired of waiting?



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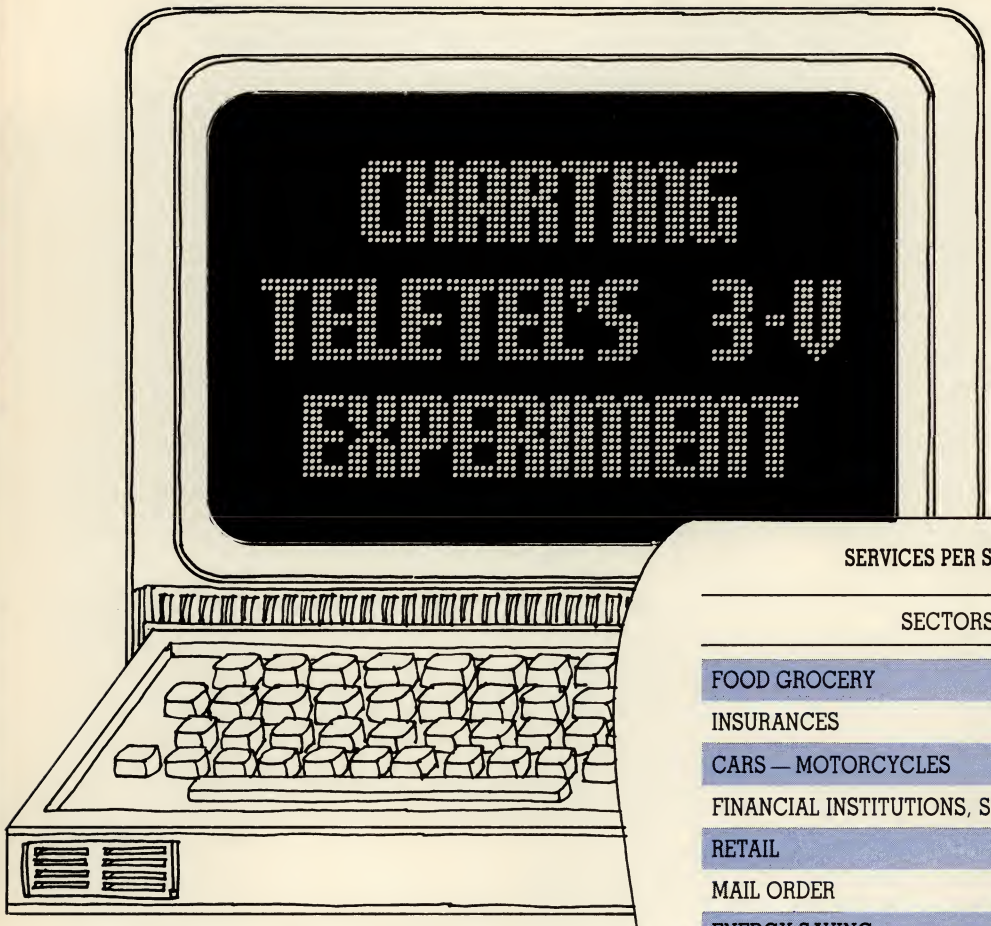


CHARTING TELETEL'S 3-V EXPERIMENT

by G. Berton Latamore

The results of an exhaustive study on videotex usage in France are yielding the only scientific findings on home videotex ever released to the public. The upshot: A well-rounded videotex service has mass appeal.

The average urban Frenchman will spend 43.5 minutes a week using a well-designed videotex service, enough to make home videotex practical. That is the preliminary conclusion of the Teletel 3V trial run in three Paris suburbs last year by Intelmatique, the French government agency for videotex; and the French Post and Telecommunications Office (PTT). Preliminary results, released in December, are the only findings of a scientific home videotex trial ever made public.

"The results are far ahead of expectations," Intelmatique Marketing Consultant Claude Sanchez said. "By the end of the experiment in June we were seeing an average of three calls per week per terminal. We didn't expect that many."

Intelmatique Chief Executive Officer Roy Bright added, "Underlying this entire exercise is an encouraging sense of continuing development of consumer interest. Whereas the average user made between 6.2 and 8.0 calls per month, analysis of the 'heavy user,' defined as a household making at least one access per week, shows a fairly consistent activity of between 14.8 and 16.2 calls per month. These results seem to suggest that there is a viable mass-market opportunity for a well-rounded videotex service which combines the inherent capability to offer up-to-date information services with the added-value features of teleshopping, telebanking, reservations and other highly-interactive services."

SERVICES PER SECTOR AS OF JULY 31, 1982

SECTORS	SERVICES
FOOD GROCERY	6
INSURANCES	14
CARS — MOTORCYCLES	4
FINANCIAL INSTITUTIONS, STOCK EXCHANGE	14
RETAIL	19
MAIL ORDER	3
ENERGY SAVING	6
MARKET STUDIES	8
REAL ESTATE, HOME APPLIANCES	6
LEISURE	4
PRESS, PUBLISHING, RADIO T.V.	25
LOCAL ADMINISTRATION	10
ADMINISTRATIONS	25
TRANSPORT, TOURISM, TRAVEL	19
EDUCATION	10
OTHER	10
MAIL BOX	1
SERVICE INFORMATION (T 3V magazine, index, further training, user's assistance)	6
TOTAL	190

The three towns involved — Velizy, Versailles and the Val de Bievre—have little in common besides proximity to Paris and the initial "V," which gave the experiment its name. Velizy is a high technology center; its residents are primarily young technical professionals. Versailles is a city of castles, a center of French traditionalism. Val de Bievre is a middle class mix of white- and blue-collar workers.

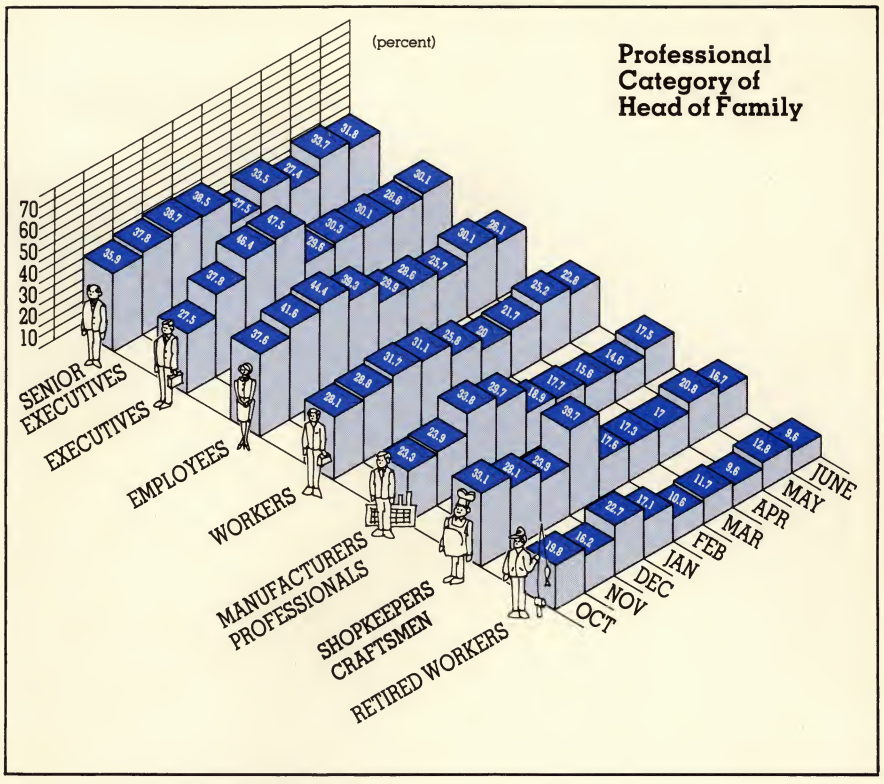
The 2,200 T3V families were chosen from 8,000 volunteers using standard scientific methods to create a sample with demographics matching those of the French urban population as a whole. These volunteers were not charged for the equipment they needed to receive the videotex signals or for connection to the service. However, they did pay small fees for the time they spent on the service, and the experiment did run some advertising along the bottoms of frames.

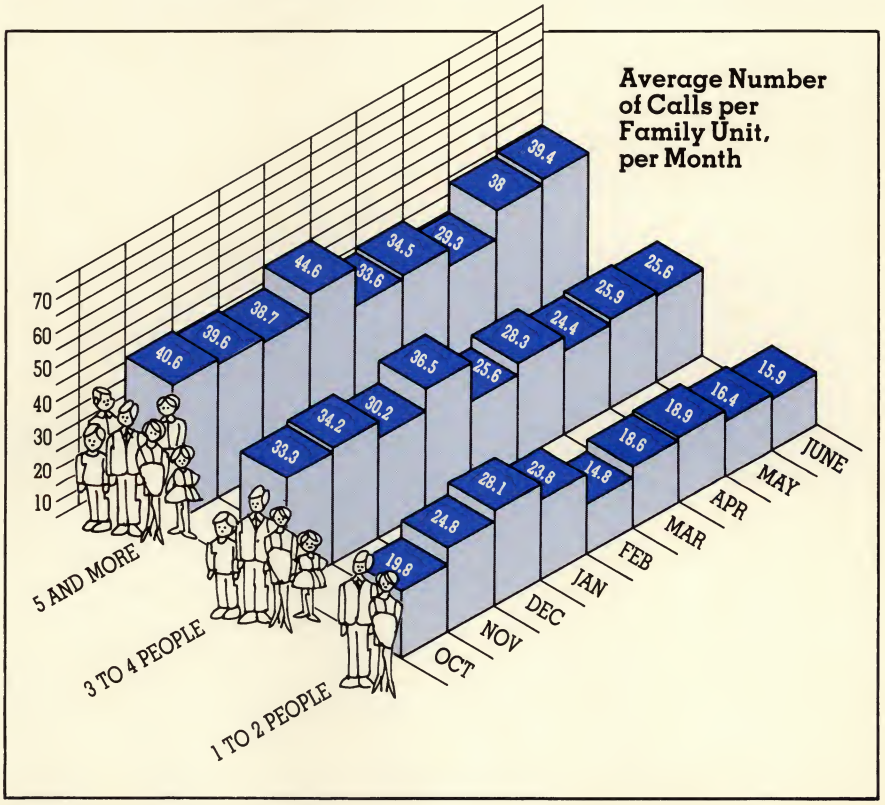
Although T3V did not pay for itself, officials believe a regular service with many more subscribers would. Trial designers also purposely eliminated the curiosity and learning factors which inevitably produce extra usage in the first months of a service by not starting the study until several months after T3V came on line. This gave participants time to learn their way around it and allowed technicians the chance to work the bugs out of it.

Except for December and January, total usage was relatively steady from month to month, rising slightly as the trial went on. This steady but slight rise may have been caused by increasing acceptance of videotex by the sample population, the addition of new services or by outside influences. The surges in December and January are being attributed to the latter by T3V officials. December usage was up because of the Christmas and New Year celebrations, which are as large in France as they are in the U.S. January is income tax filing month in France, which might be a main factor in the increased usage that month.

New databases, including the popular computer-aided education service, were added throughout the trial. The total number of T3V services grew from fewer than 100 to nearly 190 between October 1981 and June 1982. Weekly surges were sometimes caused by the addition of a new service or by school holidays. Saturday was the busiest day of the week, but Wednesday, a midweek holiday in France, was a close second.

Men were the heaviest system users. Husbands made nearly 45 percent of the calls; children under 18 made 28 percent; wives, 15 percent; young, dependent adults over 18, 12 percent.





Executives and senior executives and their families were the heaviest users, although T3V had no business-oriented services. Families headed by retired persons made the fewest calls, probably because they had no children. The largest families made the most calls.

In October 1981, the first month of the trial, the average shopkeeper's family made 33.1 T3V calls. In January his average rose to 39.7. After that, however, his average decreased; by June it was only 16.7 calls. The average senior executive's family, on the other hand, maintained a high average throughout the trial, starting with 35.9 calls in October 1981 and ending with 31.8 calls in June.

The breakdowns by age of the head

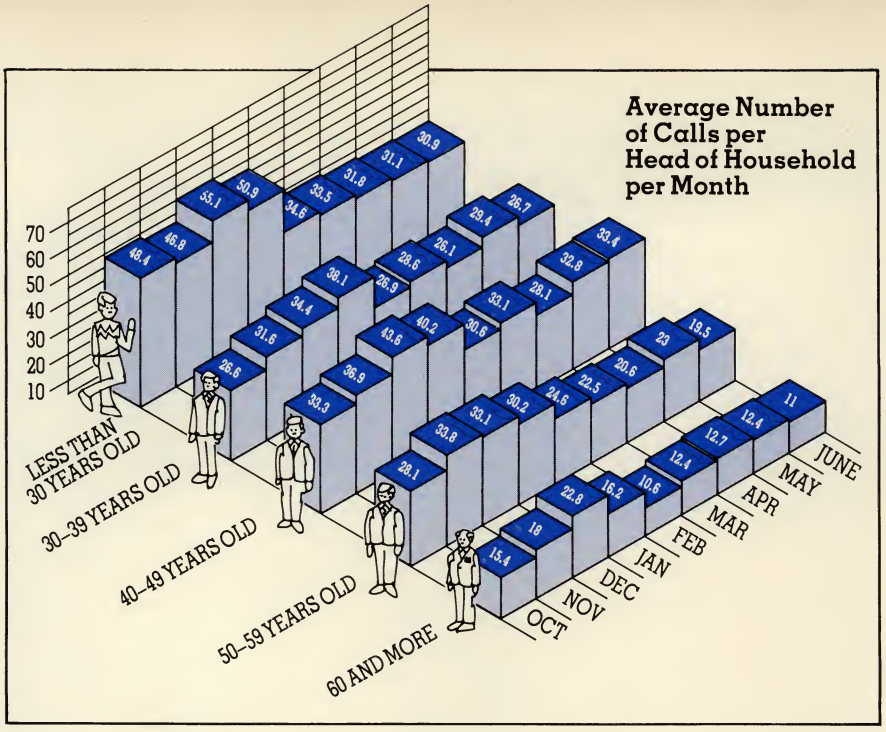
of the household show heaviest average use by those under 30, followed by those between 40 and 49. Among children, those between 12 and 14 had a higher average usage than either younger or older children.

The statistics on number of calls per service area can be deceiving for several reasons: Most individual callers to T3V accessed more than one service area per call, so that the percentages for each month add up to more than 100 percent. Also the T3V menu is included in the service group, so that the figures for that group do not indicate the same kind of interest the figures for the regular services show.

"When you look at these figures you have to remember that different groups have different numbers of services," Sanchez said. "For instance, I think the 15.5 calls per day average for the four leisure services in June more significant than the 33 call average for the 19 services in transport, tourism and travel."

The most popular single database, accessed by 20.07 percent of all calls throughout the trial, was the electronic newspaper, the *JEF (Journal Electronique Francais)*, created by the Comite de la Presse Quotidienne Francaise. This consortium of 86 French daily newspapers, created to study videotex journalism, creates videotex products for clients, advises groups on videotex, researches new techniques for use in France's several videotex trials and keeps its members informed on videotex developments.

The Comite's official analysis of *JEF's* performance, published in the October 1982 premier issue of the *JEF Newsletter*, was optimistic.



"JEF's audience can be considered a model for the future. It has gone beyond the stage of being just a gimmick, a new craze, and has now become a useful service for the consumer. It has won a more loyal audience than Teletel as a whole."

JEF had 71.2 percent of the total activity in the 28-member press and publishing group. The report attributes this success to the efforts of the *JEF* team, the largest in Velizy; the lack of dynamism of the other press databases; the inherent opportunity of a news service for constant update; the variety of information offered; and the care with which each section was targeted to a particular audience.

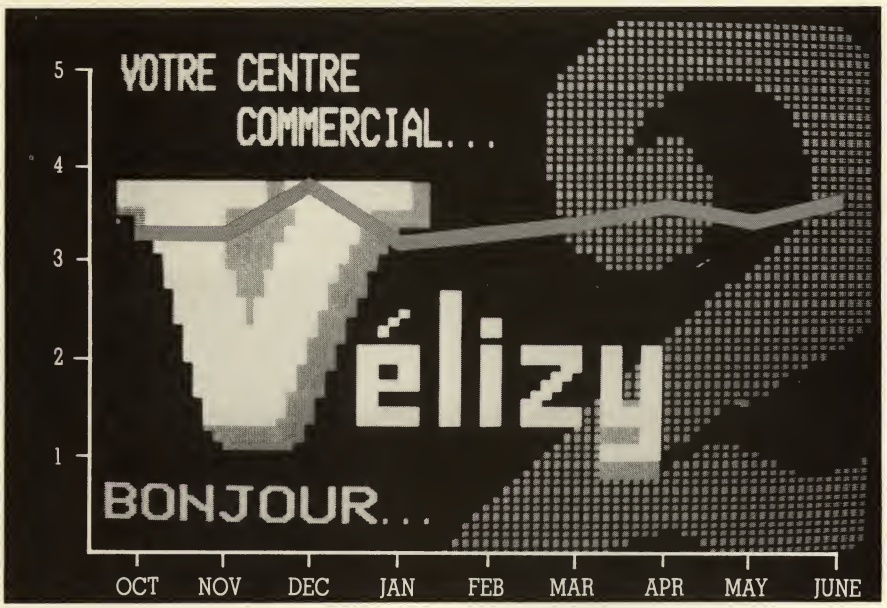
The M3V electronic mail service was also heavily used. Even though users paid at least twice the cost of a telephone call to use M3V, 1,875 T3V participants were active M3V users, making an average of 1,500 calls to it a week. Each subscriber could create nine different common interest groups (CIGs), and 343 were created.

Altogether, 11,000 frames of 800 bytes each were available on T3V. Of these, 60,000 frames were on the T3V central computers in Velizy. The rest were on 24 remote computers accessed through a Teletel remote gateway. These included the banking and catalog services. Eleven of these were connected to T3V through Transpac,

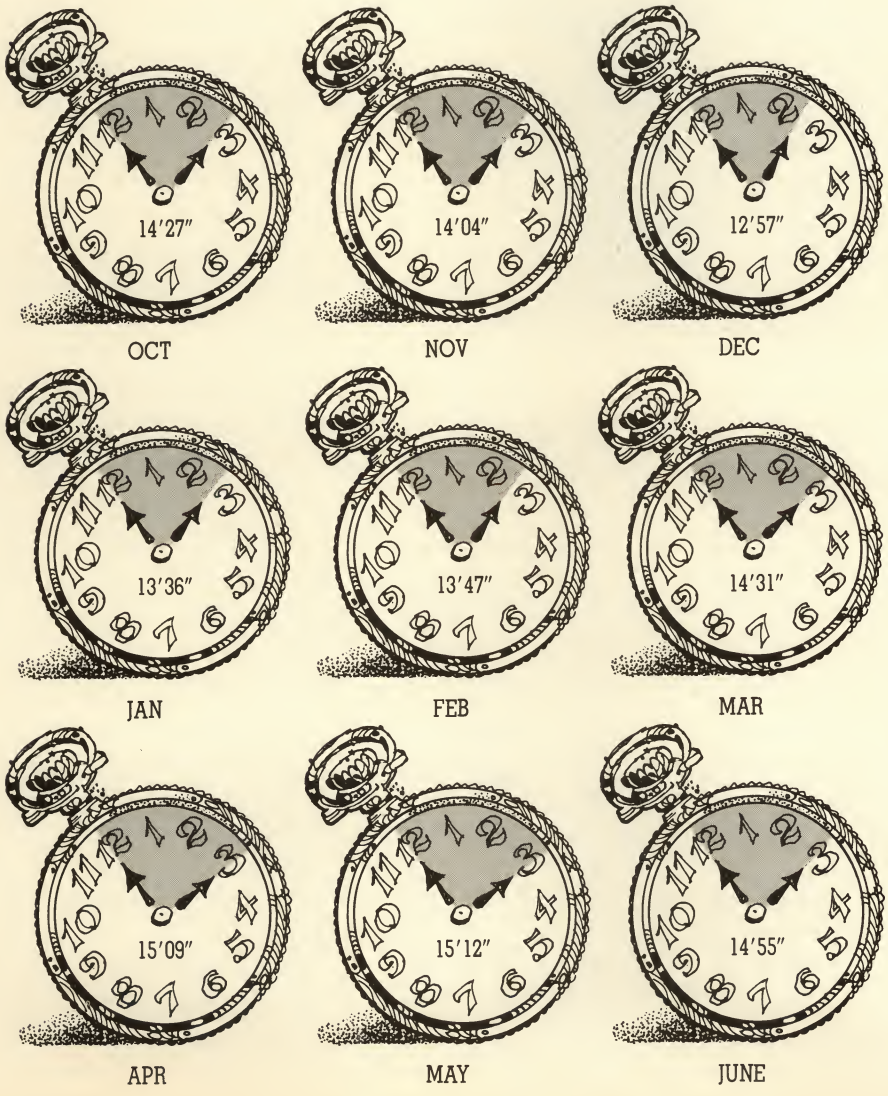
Percentage of Calls Accessing Each Service

	SECTEUR	FOOD GROCERY	INSURANCE COMPANY	CARS MOTORCYCLES	BANKS, FINANCIAL COMPANIES STOCK EXCHANGE	RETAIL INDUSTRY	MAIL ORDER	ENERGY SAVING	MARKET STUDIES	REAL ESTATE, HOME APPLIANCES	LEISURE	PRESS, PUBLISHING, RADIO TV	PRESS, PUBLISHING RADIO TV (magazines)	LOCAL ADMINISTRATION	ADMINISTRATIONS	TRANSPORTATION, TOURISM, TRAVEL	EDUCATION	OTHERS	ELECTRONIC MAIL BOX	SERVICE INFORMATION
JUN	10.8	10.9	16.1	30.5	18.3	9.6	3.4	5.4	5.9	15.5	27.3	46.5	15.3	13	33	12.9	7.6	30.5	51.4
MAY	7.4	9.5	15.4	30	21.8	9.9	3.9	5.3	6.1	18	24.9	49.4	20.4	15.2	34.4	19	7.7	33	55.5
APR	8.9	8.7	12	26	23.3	9	4.5	7.1	5.7	18	24.1	44.9	15.6	14.7	32.4	4.8	6.5	27.5	51
MAR	5	9.2	11.2	29.5	29.8	11.8	7	5.7	9	20.1	25	50.3	19.9	12.9	36.5	—	7.4	33	55.5
FEB	5.3	10.4	11.3	26.7	27.5	13.7	6.3	5.3	4.4	21.1	24.2	49.1	16.1	14.9	34.2	—	5.7	31.5	54.1
JAN	7.5	8.3	24.4	26.8	30.9	14.2	6.8	5.8	5.2	27.9	30	54.7	16.5	11.2	40.2	—	7.5	36.7	59.6

Number of Services Accessed per Call.



Average Duration of a Call



the French national X.25 protocol packet switched network, with the remainder connected through leased lines.

Although the formal study is over, the T3V service is still expanding. The services involved in the trial are continuing and new ones are being added. With the formal trial over, T3V will be made available generally in the three cities.

The statistics from the trial are to be presented to the French parliament in at least two reports. Parliament will ultimately determine the fate of home videotex in France and Roy Bright expects the answer by July. If the French government approves, the service will be expanded nationally in conjunction with the electronic telephone directory service tested separately last year. This is being offered to any of the French Departments or administrative regions that request it, according to Sanchez. As in T3V, the receiving equipment will be supplied free of charge and users will pay for time on the system and for the telephone call, itself. The service offered would include many T3V databases as well as some local ones.

The T3V service would also be made available on an individual subscriber basis in areas which do not request the electronic directory. However, subscribers in these regions would have to pay rent on receiving equipment.

Although T3V is a French experiment, its success may have important implications for home videotex in the U.S. and other western nations. First, it demonstrated that videotex is not just a technician's toy—it will be accepted and used by most classes of society including blue collar workers and retired persons. It also shows the kind of services which will be accepted. Since most of that information is publicly available, it will influence development of videotex services worldwide regardless of what technology is involved.

A successful T3V will also help the French sell their Antiope videotex technology in the U.S. and other countries. That is one of the main concerns of Intelmatique, and the French technology is being used in several small U.S. trials. Although T3V was not a hardware trial, it did demonstrate the dependability of the French equipment and the acceptability of alphamosaic graphics.

G. Berton Latamore is a free-lance writer from Providence, RI.

Technology opens the window

The MicroBrailler 2400, a paperless braille device by Triformation Systems.

SENSORY AID DEVICES FOR THE BLIND

Computers may be the window on the world for the blind, but for that window to open, blind computer users must be outfitted with more than the usual keyboard, CRT, modem and software. They must also have various sensory aid devices; which essentially serve the function of eyesight and allow the blind to use the computer.

Various companies are engaged in research and manufacturing of these sensory aid devices that primarily utilize computerized speech and braille. These devices can be used by employing organizations who are interested in hiring the blind, as well as at home on personal computers.

Says Carolyn Nelson, marketing specialist with Triformation Systems, Inc., "We want to help employers realize that with just a piece of equipment they can hire a blind person, get him off welfare and teach him to help himself. The computer is the future, and the blind can use it just as well as the sighted, provided they have the special aids."

It is impossible to talk about sensory aid devices for the blind without first mentioning the Kurzweil Reading Machine, which scans printed material, transmits the image in electronic form to a micro-based computer that separates and recognizes the characters to produce actual speech. It can operate at about 225 words per minute, which is 50 percent faster than normal speech. The reading rate can be adjusted, lines or words can be repeated and the machine can read any type face or size.

Produced by Kurzweil Computer Products, Inc. of Cambridge, Massachusetts, a division of Xerox, the unit is priced at $30,000, effectively placing it out of the range of personal users and many organizations. However,

Using Telesensory Systems' Optacon: Technology opens a whole new world to the blind

the Kurzweil Reading Machine is available for use at about 250 libraries across the country, including the New York Public Library.

Computers that talk are ideal for the blind and Maryland Computer Services of Forest Hill, Maryland has developed a system that provides the blind with a fast, easy way to access any computerized data. Total Talk is a Hewlett-Packard (HP) interactive computer terminal with speech output added. It converts computer transmitted data and data entered through its keyboard into high quality, easy-to-understand, full word synthesized speech. It is equipped with a CRT screen providing visual as well as audio feedback and opens virtually all computer-related employment opportunities to the blind. Its many applications include programming, data entry, order processing, claims processing, reservation services, word processing, information management and legal research.

Total Talk was programmed to speak in much the same way a child is taught to read phonetically, recognizing English language rules as well as the many exceptions to those rules. It also recognizes punctuation, inserting pauses and changes in inflection where indicated. Total Talk differs from most other speech technologies in that the speech is dynamically composed, creating a virtually unlimited vocabulary.

This unique device, which sells for $4,990, is currently being used by administrators, engineers, judges, lawyers, librarians, programmers, students, systems analysts and teachers in more than 50 corporations, nonprofit organizations and universities across the country.

Other talking computer products manufactured by Maryland Computer Services include Speak Easy, which converts data to speech and serves an audible equivalent to a printer or video display, and Information Thru Speech (ITS), which adds speech output to the computing power and data storage capacity of the HP-125 microcomputer. Speak Easy sells for $3,000, and ITS costs $7,995.

Also designed for employers of the blind are the Free Scan Speech Terminals, which sell for $4,495 and are manufactured by Triformation Systems, Inc. of Stuart, Florida. These interactive computer terminals deliver ouput in audible form. The blind operator can interact with the computer, call up "pages" of information and quickly scan the material stored in the terminal. Function keys permit the operator to review the material stored, both vertically and horizontally. Varying audible signals tell the operator where he is on the "page" of information.

When the specific data is located, the terminal verbally reads out the information at a rate determined by the operator. A speed switch permits the operator to increase the rate at which

Triformations Systems' Free Scan Speech Terminal delivers output in an audible form.

BTS-2 micro-based system by Triformation Systems translates printed materials into braille.

the machine audibly reads the material.

Instead of using their sense of hearing to listen to computers that talk, the blind can also utilize their sense of touch to "read" the data from a computer.

This spring Maryland Computer Services will market a new device which is a bi-directional braille computer terminal with a braille writer. Developed by Tim Cranmer, who recently retired as technical services director of the Kentucky State Department for the Blind, the braille computer has vocational and educational applications and is an excellent sensory aid device for those requiring hard copy.

Triformation Systems also produces a hard copy braille printer. This micro-based system translates printed materials into Grade 2 braille. Copying from inkprint material, the sighted operator enters the text to be translated into the microcomputer via the keyboard. The text also appears on the display screen, allowing proofreading and editing of the entry. The microcomputer stores the information on a diskette, translates it into Grade 2 braille and stores it on a diskette in the translated form. The coded information is transmitted to the embossing device for braille printout. Once stored, the material can be embossed as often as necessary. Cost of the micro-based system is $9,850 and the braille embossing device is $14,500.

In addition, Triformation manufactures a paperless Braille device, the MicroBrailler 2400, which can be used as a notebook, audio recorder, data processor and computer terminal. Braille, which has been stored on cassette tape, is read on the device's braille display, which also has a built-in computer interface. The unit sells for $4,850.

The VersaBraille system, manufactured by Telesensory Systems, Inc. of Palo Alto, California, is a portable braille word processor that allows review and alteration of selected text without re-brailling entire pages. This is a great time-saving device, for when a braillist makes an error it cannot be corrected, and the page must be started over again. The VersaBraille sells for $6,950.

Another sensory aid device, which interestingly does not utilize braille or speech, is Telesensory's Optacon. It is a print reading system that converts the image of a printed letter or symbol, exactly as it appears in the text, into a tactile form that can be felt with one finger. Different type styles, symbols and even languages can be read with the Optacon, because it reproduces exactly what is printed in an enlarged vibrating form.

To operate the Optacon, the user moves a miniature camera, which is the size of a pocket knife, across a line of print with the right hand. The index finger of the left hand is placed on the Optacon's tactile array, which is approximately one and a half inches long and one inch wide. As the camera is moved across the letter, the image is simultaneously reproduced on the tactile array by vibrating rods. The reading finger feels the enlarged letter as it passes across the tactile screen. Whatever image is viewed by the camera's lens is thereby felt by the user. Training is essential for mastering the skills required to read effectively with the Optacon.

It can be used to read not only data from a computer terminal, but also recipes from a cookbook, typed correspondence or bank statements and bills. The Optacon is priced at $4,295 with an additional $375 for the lens module needed to read from a CRT.

Cathryn Conroy is a free-lance writer from Columbus.

LEARNING THE TIMEX SINCLAIR 1000/ZX81 KEYBOARD

by Fred Blechman

```
   10  PRINT    " POSITIVE NUMBER          ?=
   20  INPUT    A
   30  PRINT    A
   40  IF  A<=0  THEN   GOTO  100
   50  LET  X=SQR   A
   60  PRINT    TAB   2; "      SQUARE   ROOT
    = ";X
   70  PRINT  "--------------------
-----------"
   80  GOTO  10
  100  PRINT   AT   21,10;"            END
"
```

LISTING 1 — KEYBOARD-ENTRY PRACTICE PROGRAM

The Timex Sinclair 1000 and the Sinclair ZX81 are almost identical, since the Timex 1000 is a 2K RAM version of the ZX81, which has 1K RAM. They use the same very ingenious — but confusing — keyboard and BASIC language. Some keys have as many as *six* different uses!

I had been punching microcomputer keyboards for four years when I got my ZX81 and the keyboard was a complete mystery to me at first. The Sinclair manual didn't do a very good job of explaining the various cursors (there are *five* of them) until page 145 in Appendix C. The Timex manual has been re-written and does a better job, but only if you carefully go through it page-by-page. If you are eager to charge ahead, you'll get hopelessly confused.

We're going to cover all keyboard entry modes with a simple program, defining each keystroke needed to enter the program. Listing 1 is the program, which calculates the square root of a desired number. Look at the program carefully. If you can enter it — reverse video and graphics included — from the Timex 1000 or ZX81 keyboard, don't bother reading the rest of this article. However, if graphic symbols, function calls, reverse video and cursor modes mystify you, read on!

The cursor

First of all, you must understand what the screen "cursor" is trying to tell you. The cursor is the single black block with either a white K, L, G, F or S inside it, indicating the computer "mode." The cursor starts at the lower left corner of the screen and moves to the right as you press keys. When entering or editing program lines, the cursor primarily performs two functions: It tells you what KIND of keystroke is expected next (mode), and *where* it will be entered on the line.

The SHIFT-key determines whether a key is "shifted" (SHIFT-key and another key pressed at the same time) or "unshifted" (key pressed alone). I will note a shifted key with the notation SHIFT/key, such as SHIFT/P.

Back to the cursor. When a K is in the cursor block, the computer is expecting a line number or "keyword." Keywords, or "tokens," are the words or abbreviations printed in white *above* most keys (unshifted) or in red at the TOP of some keys (shifted).

An L in the cursor block means the next entry expected is a character or symbol — the bold, black character at the lower left of each key if unshifted, or the red symbol at the upper right of some keys if shifted.

A G in the cursor block means the next unshifted keyboard entry will be a reverse video character (white on black background) or, if shifted, a graphic block (lower right side of many keys).

An F in the cursor block means the next keyboard entry will be a "function" — the words or abbreviations (tokens) printed in white *below* many keys.

An S in the cursor block means "syntax error" — a mistake in entry.

The shifty SHIFT-key

Confused? Not to worry — all will be clear shortly. Now, the next question you probably have is, "How do I access these various cursors, characters, symbols, graphics and tokens when I want them?" The "key" is the SHIFT-key, at the lower left of the keyboard. Using the proper cursor-block, with or without the SHIFT-key, determines what each key will input to the computer. Table I shows each of the cursors, how to access them, and what they produce when unshifted and shifted. You'll learn these rules quickly with some practice entering program lines, as we'll be doing shortly.

Actually, the computer is smart enough to know when to show the proper cursor for normal (keyboard or letter) entry. Each program line starts with a K-cursor until you enter the line number followed by a keyword. The cursor then changes to an L. Now, if you want a G-cursor, press SHIFT/9. For an F-cursor, press SHIFT/ENTER. Both will "toggle" — switch back and forth — each time you press the key combination. Keep your eye on that cursor symbol, since it controls the meaning of each keystroke.

Entering the program

All right, let's put all this to use actually entering Listing 1 into your Timex Sinclair 1000 or ZX81. First, get your computer powered up. Your video screen should be blank except for a K-cursor in the lower left corner. Adjust your TV tuning, brightness and contrast controls for a sharp, clear cursor, and follow me as we enter this program one line at a time, keystroke-by-keystroke:

LINE 10: Press the 1-key, then the 0-key. Notice how the K-cursor moves to the right as you enter the numbers. Now press the P-key, which has the keyword PRINT above it. Magic! The entire word PRINT, with a space before and after, appears and the cursor moves over and changes to an L automatically. (Most microcomputers require that you type in keywords and spaces one character at a time!) Next press the SHIFT-key and the P-key at the same time (which we note as SHIFT/P) and you get a quotation mark — the red symbol on the P-key. If you goof at anytime, press SHIFT/0 to DELETE the last keystroke. Getting the idea? Beginning to see what a "smart" keyboard you're dealing with? Okay, now press the SPACE-key (lower right corner of the keyboard) for a space after the quotation mark. The next characters are reverse-video, which will take a G-cursor. Puzzled? Look at the 9-key and you'll see the word GRAPHICS in red. Just press SHIFT/9 and the cursor changes from an L to a G. Now you simply enter the letters and space thusly: P,O,S,I,T,I,V,E, SPACE, N,U,M,B,E,R (the commas are my notation to separate keystrokes). Now SHIFT/9 again to an L-cursor and press the SPACE-key once. Now you want a question

CURSOR	TO OBTAIN THIS	UNSHIFTED KEY	SHIFTED KEY
K	Automatic when keyword expected	Line number and white words above keys	Red words at TOP of keys
L	Automatic when character expected	Letters, numbers and period	Red words and symbols at TOP of keys
G	Press SHIFT and 9 keys together	Inverse video characters	Graphic characters/ inverse punctuation
F	Press SHIFT and ENTER together	White words BELOW keys	Same as unshifted

TABLE I—CURSOR ACTION

mark, which appears in red on the C-key. Just SHIFT/C and there it is! Now, SHIFT/L for the equals sign, then SPACE, the SHIFT/P for the quotation mark, and SHIFT/X for the semi-colon. That's the whole line, so press the ENTER-key and line 10 should appear in all its glory at the top of the screen. Ignore the inverse right-arrow after the line number. It merely means "current-line," and has to do with program editing — not covered in this article.

The cursed S-cursor!

HINT: Unless you're very careful, you've made an error in entry and Line 10 just stubbornly sits at the bottom of your screen — with a second cursor added... the dreaded S-cursor! Don't panic! This only means that the computer "BASIC Interpreter" has found a syntax error — improper program grammar. A common syntax error, for example, is omitting a closing quotation mark with a PRINT statement.

The S-cursor is positioned right before the error point. You need to move the L-cursor left or right to the error position and correct it. The left-arrow (SHIFT/5) and the right-arrow (SHIFT/8) will move the cursor anywhere on the line, and SHIFT/0 will delete the keystroke to the left of the cursor. You can add whatever is needed from the keyboard. This is called line editing. Once the S-cursor appears, you can't enter that line (or any other line) into the program until the error is corrected, or the keystrokes deleted back to the point BEFORE the S-cursor. A shortcut, if you get completely confused and want to start the line over, is to press SHIFT/1 and the entire line gets zapped back to the K-cursor!

Back to the program

LINE 20: This is easy. The K-cursor is sitting at the lower left corner of the screen waiting for you. Just press the 2-key, then the 0-key for the line number. Then press the I-key for the keyword INPUT. Now press the A-key, then ENTER-key. Line 20 appears on the screen below line 10 (and line 20 has the current-line indicator).

LINE 30: Just as easy. Keystrokes (with commas to separate them) are 3,0,P,A,ENTER.

LINE 40: IF is a keyword, so just press 4,0,U and then A. Do not use the separate letters I and F for IF, since keywords cannot be entered by individual letters. Next you want the less-than-or-equal-to symbol printed in red on the R-key. SHIFT/R and you have it! Next press 0. Now you want the token THEN, but you have an L-cursor. No matter. Since the word THEN is printed in red on the 3-key, just SHIFT/3. The cursor changes to a K-cursor automatically (smart keyboard!) since a keyword must follow THEN. Press the G-key and GOTO appears (with a space before and after). Press 1,0,0 and the line is put into the program by pressing ENTER.

LINE 50: The first part of this line is easy. Keystrokes are 5,0,L,X,SHIFT/L. But now you need the square-root function SQR, which is printed in white BELOW the H-key. This means you need an F-cursor. See the word FUNCTION printed in red on the ENTER key? Press the SHIFT/ENTER keys together and the L-cursor becomes an F-cursor. Now press the H-key and SQR appears (with a space). Finish the line with A and ENTER.

Quiz time

LINE 60: Here's your first quiz. We've actually covered ALMOST everything needed to enter this line, which includes a keyword, characters, a function and a graphic symbol. Try it yourself. If you get lost, the keystrokes follow:

6,0,P, SHIFT/ENTER, P,2, SHIFT/X, SHIFT/P, SHIFT/9, SHIFT/H, SHIFT/9, SPACE, S,Q,U,A,R,E, SPACE, R,O,O,T, SPACE, SHIFT/9, SHIFT/H, SHIFT/9, SPACE, SHIFT/L, SPACE, SHIFT/P, SHIFT/X,X, ENTER

Did you get caught by the SHIFT/H? To get the block symbol printed on some keys, you must be in the graphic mode (G-cursor) and press the SHIFT-key together with the character key. Tricky, eh?

LINE 70: This line is a snap. You want to print 32 dashes, which are SHIFT/J. Here are the keystrokes:

7, 0, P, SHIFT/P, SHIFT/J (32 times), SHIFT/P, ENTER

LINE 80: How easy can it be?

8,0,G,1,0,ENTER

Test time!

LINE 100: What happened to line 90? I didn't use it. There is no rule that every line number must be used, or that they follow any specific interval — although counting by tens has become somewhat standard. This leaves room for later insertions.

Anyhow, line 100 is your final quiz. Everything to allow you to enter this line has been covered. It uses the graphic symbol on the T-key three times before the word END (which is NOT a keyword, so must be typed using individual characters) and three graphic symbols of the Y-key after END.

ENTER this line, then RUN (R-key followed by ENTER). The screen clears and asks you to input a positive number. See the L-cursor at the lower left of the screen? As you type in a number, it appears before the cursor. When you press ENTER, your number appears after the "prompt," then the square root calculation is made and displayed, followed by a dotted line across the screen and another prompt. To "escape" from the program, use a zero or negative number for the input, or press SHIFT/A to STOP the program.

If things don't happen this way, look for an error in your program entry by carefully checking with LIST (K-key and ENTER). If things DO work, you've conquered the Timex 1000 or ZX81 keyboard!

Fred Blechman is a free-lance writer from Los Angeles.

TWO COMPUTING TASKS AT ONE TIME

SuperSpooler
Compulink Corp.
1840 Industrial Circle
Longmont, CO 80501
(303) 651-2014

Reviewed by Ernest E. Mau

Many users of recreational and business computers waste valuable time just waiting for hardcopy printouts of program listings, computation results, and so on. How nice it would be if printouts could be obtained without having to tie up the entire system. Well, they can if a "buffer" is installed between the computer and printer to receive, store, and then re-transmit data to the printer while freeing the computer for other more important or more cost-effective tasks.

One such device is the Model SS-1000 SooperSpooler™, privided by Compulink Corporation. It's small desktop unit serving as an intelligent, multiple-function interface that combines a fully operational Z-80 microcompressor and either 16K or 62K of memory.

As an "intelligent" post-processor, it not only provides temporary storage for data, but it is controllable by switches or software commands and can provide space compression, automatic pagination, single-sheet printing, and combinations. With automatic pagination in effect, the printer skips over the perforation of continous paper or, if set for single sheets, stops at the end of each sheet to allow new paper to be loaded. That's something not otherwise attainable with straightforward listings of things like programs.

Under control of commands sent by the computer, SooperSpooler can be directed to set page lengths (number of lines). Furthermore, it can print headings on each page, number and format pages, format individual lines, and override any prior switch settings. Left and right margins can be controlled, and indents can be selected to improve the readability of printouts.

Even without the formatting capabilities, the buffering is of immense value to serious computer users because it optimizes system utilization. No more need to wait on a printer (unless the output is longer than 62,000 characters). While the SooperSpooler and printer are doing their thing, the computer can be running other programs, editing word-processing files, or can be switched off entirely.

The feature this reviewer has enjoyed the most is that SooperSpooler can be equipped with optional dual input and dual output ports. That is, inputs can be provided via a serial or parallel port, and outputs can be directed to either a serial or parallel printer. The unit tested was connected to two computers—an S-100 machine on the serial port and an Apple II Plus on the parallel port. It then was connected to two printers—a letter-quality unit on the serial port and a dot-matrix unit on the parallel side. SooperSpooler automatically accepts inputs from either computer without changing switches. It then directs the outputs to either computer in accordance with the current rear-panel switch setting. This is a real advantage since either computer can use either printer just by throwing a single switch, giving both systems access to high-speed dot-matrix outputs for drafts and personal copies, or to higher-quality slower-speed printouts for finished products.

Alternatively, the S-100 system has both serial and parallel output capabilities running off separate ports and different software operating systems. Both outputs from the same machine can be routed through SooperSpooler to use either printer at will, without exiting the system and reloading operating systems.

If all this sounds delightful, it is! Once accustomed to using the post-processing, buffering, and printer-switching features, it's hard to imagine having any kind of efficiency without SooperSpooler in operation.

However, the unit is not totally free of flaws and potential problems. One is that the present model has the printer selection switch accessible through an opening in the rear panel. That makes it hard to get at and somewhat inconvenient for frequent changes. Another model, soon to be released, will have the selection switch in a more accessible location.

There's no way to switch SooperSpooler "off line." There are occasions when it might be desirable to have the buffer "transparent" so it doesn't store

the data stream, such as during certain word processing tasks where frequent interruptions are anticipated. Right now, there's no printing capability if the buffer is switched off, and it always buffers the data if it's switched on. The post-processing features can be turned off, but not the buffering.

The standard configuration allows independent selection of input and output transmission speeds (baud rates) at the RS-232 serial ports, but handshaking vs. protocol, bit patterns, number of stop bits, parity, and other features are not independent and must be the same for both computer and printer. However, Compulink personnel are willing to work with customers to design special interfaces to solve basic incompatibilities between the printer and computer.

A few operational difficulties have been observed. One, occurring only when data is input on the serial port, shows up as printer slowdown during the first few thousand bytes of transferred data. Initially, SooperSpooler gives priority to receiving data from the computer, so for the first 5K to 7K bytes, the printer slows considerably, often printing in short bursts instead of as a continuous stream. Then, priority switches to the printer output, allowing it to speed up, but making the computer slow down. If the computer connects to the parallel port, there's no problem at all, and the operations proceed at high speed on both ends.

In the test installation, SooperSpooler did demonstrate a capability of "glitching" the printer (and occasionally the computer) when it was switched on or off. This usually appeared as a random character output to the printer or fed back into the com-

puter. It may be a problem with the operating software of the computer system, however, and isn't necessarily a fault of the buffer. The problem can be eliminated just by adopting a habit of switching SooperSpooler on before any other components, and switching it off after all others.

The only other problem occurs when trying to print several documents in sequence. As a first-in first-out (FIFO) buffer, it might be expected that outputs could be "stacked" into it in rapid sequence. However, every time I've tried to send a second document before the first was finished printing, the unprinted end of the first and most of the second were garbled. Again, it might be either my software or the SooperSpooler at fault, but I had to sidestep the problem by simply waiting until one document finished before sending the next.

Nevertheless, Compulink is providing a quality product that greatly enhances any computer installation. It saves time and effort, and that is, after all, the name of the game. In three months of testing, there have been no hardware failures other than a single blown fuse when the system took a severe power "hit," and the internal diagnostics continue to indicate that the programmed ROMs and 62K of RAM chips are operating properly.

Additional information on SooperSpooler may be obtained by contacting Compulink Corporation, 1840 Industrial Circle, Longmont, CO 80501, or telephoning them at (303) 651-2014. The SS-1000 in the 16K configuration with two parallel ports sells for $349. The option to add two RS-232C serial ports costs $95. The memory expansion from 16K to 62K costs $159.

Ernest Mau is a free-lance writer from Denver.

MAC INKER

Computer Friends
100 N. W. 86th Avenue
Portland, OR 97229
(503)297-2321 $54.95 postpaid

Reviewed by Fred Blechman

If you use a typical computer printer, you pay a premium price for ribbons. In most cases, the ribbons are enclosed in special cartridges and even though you may not be aware of it, the ink is special. Therefore, when you finally have run the ribbon to the point where the printout is too light, you probably need to buy a whole new cartridge.

"No," you say, "I get mine reloaded. This costs a lot less than a new cartridge." Well, if you don't consider your time to package and mail the old cartridge, the postage, the minimums, and the handling charges — and the sometimes-weeks to get the thing back — then it's a good deal.

Or you may try your own reloading, buying just the new ribbon. This could be reasonable, depending on the cartridge. Some just snap apart. Others have small parts, including springs, and take an expert to disassemble, reload and reassemble. And it'll take you a week to get your hands clean!

Then there's re-inking. All sorts of schemes have been tried, from built-on ink-saturated pads put in the ribbon path to spraying the ribbon with WD-40 to spread the non-used ink into the used areas. Messy at best — and a real threat to a dot-matrix printer head if the wrong ink is used! (Dot-matrix printer head pins need a lubricating ink. Ink made for full-character impact printers does not need a lubricant.)

Another solution is the Mac Inker from Computer Friends, which re-inks ribbons right in their cartridge or on their spools. Different models are available, depending on your printer. I obtained two models, one for the Epson MX-80 or MX-100 ribbon cartridges, and one for the spool-type ribbons used on the OKIDATA Microline series.

In use the cartridge or spool is removed from the printer and placed on the Inker, which has a small low-speed gear-driven 117VAC motor and custom shaft or platform. The motor pulls the ribbon through the cartridges (or from spool-to-spool). The ribbon follows a snake-like path around cylindrical inked-saturated felt rollers or idlers that turn on vertical shafts. Ink is furnished in small squeeze bottles. You just squeeze a little ink into the well on top of an ink roller. As the ribbon passes over a roller, it picks up ink, which then distributes itself to the dry areas.

Continuous ribbons just run until you stop the motor with a push on-off switch. The Epson Inker motor runs at sixteen revolutions a minute and has a splined shaft to mate with the MX-80 or MX-100 cartridge. The spool Inker, in addition to the regular on-off switch, uses a microswitch to stop the motor when the take-up spool is full. The spools rest on circular platforms, with the driving platform turning at six revolutions a minute.

All models of the Inker are built on an aluminum casting that measures 6" by 9", with three 2"-high legs. All parts are bolted directly to this casting, so the unit is very ruggedly built. The five-foot linecord, motor and switch (or switches, in the case of the spool-type inker) are wired together under the chassis with wire-nuts and protected with a molded cap.

I tested the spool Inker with two overused "dry" ribbons I had stopped using with my Microline-80 printer because the printing was too light. The first ribbon took several runs through the inker, mostly because it takes some time for the ink to penetrate through to the outer surface of the felt rollers. The second ribbon was inked sufficiently in two runs through. The spool Inker runs at about one-third the speed of the Epson Inker, and took sixteen minutes to pull the ribbon from one spool to the other. The results, however, were great; printing with these ribbons is very dark.

I don't have an Epson printer, so I didn't get to test that model, but the principle is identical. The instructions furnished with each unit were well-written, and the Epson Inker instructions described a technique for half-twisting the ribbon inside the cartridge to double its use.

The Inker comes complete with dot-matrix lubricating ink. Additional ink is available from Computer Friends,

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and they claim the average cost for re-inking is about five cents per ribbon. Plastic vials are provided to put over the ink rollers to slow down ink evaporation during storage, and allow you to handle the unit without getting ink all over everything you touch!

When ordering a Mac Inker you must specify the make and model of your printer. The $54.95 price includes shipping, handling and insurance. The economics of this are pretty simple. Take the cost of a new ribbon for your printer and divide that into $55. That's essentially the "break-even" point at which re-inking will have paid for itself. Add to that the convenience of being able to re-ink without the hassle of sending away your ribbon and perhaps waiting weeks to get it back. Subtract the bother of re-inking—and you have "the bottom line."

Fred Blechman is a free-lance writer from Los Angeles.

COMMUNICATING WITHOUT WIRES

LCM-100 Line Carrier Modems
Communications Research Corp.
1720 130th Avenue N.E.
Bellvue, WA 98005
(800) 426-8075

Reviewed by Ernest E. Mau

An assumption! You have a computer and terminal as separate units. Another assumption! You'd like the computer in the basement and the terminal on the second floor. Can you do it? Of course! Just run an interface cable between the two. The trick is to do it without cable. If that sounds impossible, it's not. At least not with LCM-100 Line Carrier Modems from Communications Research Corporation. According to their advertising, you can have "wireless" communication by superimposing a signal on electrical wiring in your building.

The secret is called frequency shift keying (FSK), in which the modems transmit and receive electrical impulses over 120VAC electrical lines, allowing transceivers to be placed anywhere in a building served by a single electrical system. Even when outlets are on separate circuits, they still can communicate. All that's necessary is to interface the computer or Data Communications Equipment (DCE) unit to one LCM-100; interface a CRT, printer, or other Data Terminal Equipment (DTE) unit to another LCM-100; and plug both modems into wall outlets. The communications link is established!

It's simple, and it works. The supplier claims to have tested the units at 9600 baud transmission rates to distances of 800 feet, and this reviewer regularly uses them at distances of 100 to 150 feet. In comparison, RS-232 cables typically limit 9600 baud speeds to less than 200 feet.

There are a number of advantages to eliminating interface cables. First, the chance of tripping over a cable is gone. Second, a vulnerable point for static damage to the system components is removed. Third, units can be separated by otherwise impenetrable barriers such as firewalls. Fourth, there's freedom to move about with a terminal, place a noisy printer in a different room, and so on. Fifth, it's no longer necessary to drill through walls and floors or prewire offices with in-wall cables and unsightly connector outlets at every anticipated working location.

There also are a few disadvantages. The most obvious is that the LCM-100 transceivers do not use RS-232 handshaking signals, meaning that computer systems relying on hardware handshaking have to be reprogrammed to use software protocol (transmitted characters) to start and stop transmissions. That can be expensive for individuals and companies without the capability of doing their own programming. Typically, this is more likely to affect printer-to-computer links rather than CRT-to-computer links. Of course, there's always the option of reducing the operating speed of something like a 1200-baud printer to 300 baud where neither handshaking nor protocol would be needed to prevent transmission overruns, but that's an overall efficiency reduction and fails to make full use of the LCM-100's 9600-baud capability.

Less obvious but more troublesome is the matter of electrical interference and noise affecting the communications link. This reviewer had to replace one set of modems because they were hypersensitive to line noise. The second set then required having an electrician install a special phase coupler at the building's power distribution panel to block out noise from appliance motors and other sources. The phase couplers are available from Communications Research, but there is the possibility that they may be prohibited by local building codes. Prospective users should check their codes and make a point of having a qualified electrician do the coupling.

Even with a coupler installed, some appliances and electrical devices still generate disturbing noise that shows up on either end of the link as an occasional random character or two. Thus far, however, I've only seen random characters at the terminal end, never at the computer end, so they've been no real problem. Special software and error-correction procedures can be implemented if necessary to minimize the effects.

The units are particularly sensitive to certain interferences. For example, they won't tolerate lighting dimmers anywhere in the building, unless those dimmers are specially designed for noise-free operation (Communications Research can make recommendations). In other cases, special electrical isolators may be required for high-noise devices like refrigerators, air conditioners, and furnaces.

It's important that the LCM-100 transceivers not be connected through power-line filters, surge suppressors, or similar devices, including reserve power supplies, since those devices tend to degrade the FSK signal to a point below the threshold for good communications. Nevertheless, the computer and terminal may be protected, as long as the LCM-100s are not. So, in a situation where equipment is running from reserve power supplies, a power failure wouldn't interrupt the computer or terminal, but it would stop communications between the two.

Another problem at the moment is that only one set of LCM-100 transceivers can be used on a single electrical system. That means only two devices may be connected by this method in any one building served by one main utility line. However, new units are expected to be introduced soon and will allow multiple links on the same electrical circuits, using discrete frequencies for modem pairs so they can communicate without mutual interference.

A final point concerns protection of magnetic media. The LCM-100s do contain small ferro-resonant transformers. Therefore, they do have electromagnetic fields which could damage diskettes and tapes set on or by the modems. However, users having any respect at all for their media have learned to keep them away from electronic devices and shouldn't be placing the media on top of electronic boxes anyway.

Overall, the LCM-100 Line Carrier Modems are impressive, and they easily deserve having received a Top Ten Award for significant product achievement at last September's Mini/Micro '82 Convention. We've had wireless radio and wireless televison for a long time, and it's time we had wireless data communications.

The few problems demonstrated by the units were solvable, with the help of the supplier. That brings up a final, but important point. Personnel at Communications Research Corporation are concerned about their customers and go to great lengths to help. If a user has a problem getting a communications link to work, all he or she has to do is call in, and the technical staff will make every attempt to solve the problem. That's an unusual philosophy in an age where many companies don't want to hear from customers once the money has been paid.

The LCM-100 Line Carrier Modems retail at a price of $365.00 a pair, and additional information can be obtained or units ordered from Communications Research Corporation, 1720 130th Avenue N.E., Bellevue, WA 98005. The phone numbers are (206)881-9550 or (800)426-8075.

Ernest Mau is a free-lance writer from Denver.

"THIS'LL DRIVE 'EM NUTS YEARS FROM NOW!"

PROFITABLE SMALL BUSINESS COMPUTING

By Frank Greenwood
$9.95 168 pages.
Published by:
Little, Brown and Company,
Boston, MA and Toronto, ON

Reviewed by Ernest E. Mau

The subtitle on the cover reads, "A Practical Guide to Finding and Using the Right Computer for Your Business Needs." That promises a great deal, and readers might expect extensive treatments of computer applications, in-depth evaluations of hardware and software approaches to diverse business needs, and thorough explanations of both advantages and disadvantages of computerization or high-technology automation.

Inside, however, the book turns into a lightweight treatment that falls short of delivering on its promise. It's another abbreviated "computer literacy" course for corporate middle-level managers and others who don't have the vaguest idea of what a computer is or what it might do.

The book is intended for new and prospective users of systems costing less than $25,000 — covering the most popular small-business systems on the market. But it assumes the reader has well-defined needs, primarily in accounting-style operations. For example, chapter three on typical applications devotes less than two and a half pages to the subject and gives two or three brief paragraphs each to billing, accounts receivable, inventory, and general ledgers. But there's nothing about assessing differences in accounting systems, weighing efficiencies of individual software packages, performing multiple tasks to improve cost-effectiveness, or other crucial concerns. I did say it's lightweight!

The discussion of hardware in chapter eight is all of 14 pages, nearly half of it pictures. Terms are defined, but there's nothing about what users should seek or how a unit should be evaluated. Sure, it's nice to know, in a sentence or two, what thermal, matrix, and daisy wheel printers are. But what about the applications of each? Why might a matrix printer be unsuitable for business correspondence, reports, manuals, and the like? When does print quality outweigh speed? What are the relative costs of maintaining and supporting each? Those kinds of questions aren't answered for printers or any other parts of a system.

The entire book is the same — a fast introduction, but no answers to serious or controversial questions. Even word processing, an application possibly more widespread than accounting, gets second-class treatment in an appendix that appears added as an afterthought.

The most valuable parts are the summary chapter and seven case studies, where the reader finds what there is of the "meat." The author makes some good points, but in generalities. Things like assessing business needs, comparing benefits, and selecting software before hardware are important but hardly justify the book without details.

It isn't even particularly original. Most of the book is credited as drawn directly from articles and commercial product reports.

The book is disappointing. It might be worth scanning in a library, but serious users probably should look elsewhere for advice.

TRS-80 DISK & OTHER MYSTERIES

by H.C. Pennington,
IJG Computer Series,
Upland, Calif., 128 pp.

Reviewed by J. Stewart Schneider and Charles Bowen

Mysteries is one of those books you read about long before you read, a sort of "Great Expectations" of computer literature. It is virtually impossible to have even a passing interest in the literature about the TRS-80 without running upon quotes from, comments about, or criticism of Mr. Pennington's little book.

And little it is, too. It's amazing that a mere 128 pages of very large type, including two appendices and a full-page discussion of Murphy's Laws, could generate so much controversy. Such a reputation makes the book hard to review. Is it a primer on disk usage or the definitive work on operating systems? Will the mystery of the disk directory be revealed? What is this teapot that has generated such a tempest?

If you're searching for a definitive work on the operation of TRSDOS, look elsewhere, because this book assuredly is not. It is not a book about any operating system at all, in fact. The complete title is *TRS-80 Disk & Other Mysteries, The How To Book of Data Recovery*, and that lack of focus in the title is echoed throughout the book. A book about the TRS-80 disk is one thing; a book about data recovery is another. This book seems to wander in search of a concept.

Does this mean it has nothing to offer? No, it doesn't mean that at all. The book has much of value, but the lack of organization so mars it that it is hard indeed to dig the gold from the bedrock.

Mysteries is divided into 13 chapters, and each chapter into subdivisions. That sort of organization makes for easy location of information through the index. Sure would be nice

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By Norman J. Wazaney Jr.

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to have an index. There is a table of contents, and with a book as short as this, that would probably do. But, oddly enough, the table of contents makes no mention of the careful chapter/subdivision structure, and refers only to page numbers.

The first chapter introduces, in abbreviated but adequate fashion, the concepts of hexadecimal, binary and decimal numbers. That would seem to indicate that the book is aimed at beginners.

Then, the next 16 pages abandon the numbering systems and discuss SuperZap — a monitor program supplied on Apparat's Newdos operating system — in excruciating detail. This section would be an admirable users manual for SuperZap, but it is of questionable value in a book on disk organization, particularly when it consumes fully 13 percent of the whole volume. If you're interested in the mysteries of SuperZap, chances are you have access to the documentation and don't really need it repeated here. If you're without Apparat's worthy operating system, you'll get more than a little bored.

The discussion of SuperZap is filled with terms like "disk sector," "directory sector," and, worse, "bad parity." Any reader who must be informed about decimal and hex notation is probably not going to know what a disk sector is, but the definition of disk sector doesn't appear until chapter 5.0, a dozen pages away.

With 13 percent of the book and three half-page cartoons under your belt, you are more than ready for some information about disk organization and data recovery. Mr. Pennington is not ready to get down to brass tacks. Instead, the next topic is a discussion of monitors, including DIRCHECK by Apparat.

This discussion, amply illustrated with screen dumps, shows how DIRCHECK pinpoints "HIT" and "GAT" errors, and Granule allocation errors. Valuable information, indeed, if the reader had been informed what a "HIT" or "GAT" error was, or what a "GAT" table contains. That information isn't found until section 6.0, some 12 pages on.

Next up are a few paragraphs recapping seven operating systems, each section ending with the statement that "data recovery procedures are normal and routine."

One quarter of the book gone, and still no discussion of TRS-80 Disks, other mysteries or data recovery techniques.

The actual data recovery sections, starting with section 5.0 and the discussion of directories are the book's gold. This material is why the reader bought the book and it is adequate, but sometimes unclear.

For example, the discussion on bytes 14 and 15 of a directory entry would make (or should have made) any editor weep. These two bytes are described as the END OF FILE (EOF) RELATIVE SECTOR. The discussion then goes on to give rules governing what must happen if the EOF byte (singular) is zero or not zero.

Nowhere is it indicated which of the two bytes defined as the END OF FILE bytes is the EOF byte. Toward the end of the discussion, it is mentioned that both bytes must be used to represent a number greater than 255, but the reader is hopelessly lost by now.

TRS-80 Disk & Other Mysteries is a compendium of valuable information scattered through a morass of trivia. The reader willing to dig out the information will be the better for it, but must do so in spite of the author, not with his assistance. The style is light, humorous and fun, but exacts a high price in terms of clarity and organization.

Industry Watch

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Put the power of the world's information in your hand with Datalink™, Series 1000, a portable communication terminal for multiple markets.

The terminal can be used to transmit and retrieve information from a multitude of sources, including databases as varied as a personal telephone directory to the New York Stock Exchange.

Equipped with rechargeable batteries and a built-in direct connect phone modem, Datalink has a high impact plastic case and an easy-to-read 16-character tilted green fluorescent display viewable in any light. It is available for under $400.

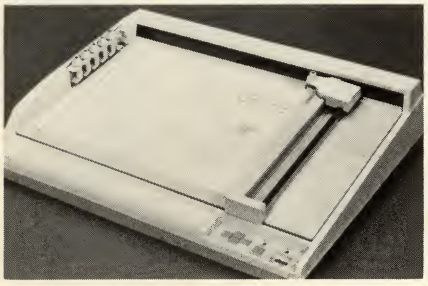
For information contact Axlon Inc., 170 N. Wolfe Rd., Sunnyvale, CA 94086.

AMPLOT II

Amdek Corp. has introduced Amplot II, a six-color plotter that is compatible with most personal computers and features high-pen speed, automatic pen retrieval and .002 inch resolution for fast, accurate plots.

Priced at $1290, Amplot II has an effective plotting range of 10 inches by 14 inches and comes with six fiber tip pens for plotting on ordinary paper or film. Chart hold-downs and a dust cover are also provided.

For information contact Amdek Corp., Marketing Dept., 2201 Lively Blvd., Elk Grove Village, IL 60007.



SPINNAKER RELEASES EDUCATIONAL GAMES

Kids can learn from computers, and one of the best ways to begin is with fun games. Spinnaker Software Corp. has produced two new educational games for children, Rhymes and Riddles™ and KinderComp™.

The programs are designed to gently ease children into the world of computers and strengthen and develop basic learning skills as youngsters become absorbed in game challenge and the expression of their own creativity.

Rhymes and Riddles is a letter guessing game presented in three formates to help children spell as well as learn words to nursery rhymes and popular sayings.

The first game, Jokes and Riddles, asks the child to complete the joke or riddle by guessing the punch line and filling in the blank space.

In Nursery Rhymes, the computer screen shows blank spaces for the first line of a well known nursery rhyme. When the child completes the first line, the second line appears. After all four lines are complete correctly, the rhyme appears on the screen with a color illustration and music.

The third game, Famous Sayings, presents the child with a famous saying for completion.

KinderComp is a program of six games for children aged three to eight. Here, the very young computer user employs a joystick or cursor key to see the results of his imagination appear on the screen.

Youngsters can draw masterpieces on the screen, scribble with color, learn letters, understand the concepts of sequence and matching and even learn how to write their own names.

Both games list for $29.95 and are available in Apple, Atari and IBM versions.

For information contact Spinnaker Software Corp., 215 First St., Cambridge, MA 02142.

AMDEK INTRODUCES COLOR MONITOR

Amdek Corp. has introduced the Color-I Plus color monitor for personal and business computers.

It features a non-glare screen for improved color perception and reduced eye-strain. A headset is also furnished for front panel compartment interconnect to the monitor's built-in audio amplifier. The unit's speaker is automatically cut off when the headset jack is inserted, providing private, undisturbing computer operation.

Superior line resolution, 260 (H), 300 (V), is provided on the 13 inch CRT. The Color-I Plus, which is UL and FCC approved, accepts a composite video signal to produce richly colored graphics or text.

The handsome cabinetry includes a built-in carrying handle, and front compartment controls make adjustments easy. The unit sells for $449.

For information contact Amdek Corp., Marketing Dept., 2201 Lively Blvd., Elk Grove Village, IL 60007.

DELTA DRAWING

Children aged four to 14 can receive an introduction to programming with Spinnaker Software Corporation's Delta Drawing™ Computer Graphics.

With Delta Drawing, children create colorful drawings on the computer screen using single keystroke commands to control the Delta cursor. Additionally, complex pictures, patterns and designs can be built from simple drawings because drawings are stored as programs and can be used to create extremely complex and sophisticated graphics.

Compatible with Apple, Atari and IBM systems, Delta Drawing lists for $59.95.

For information contact Harold Cabot & Co., Inc., 10 High St., Boston, MA 02110.

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800-848-8990
In Ohio call 614-457-8650

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B.T. MAKES A CLEAR STAND

With all the necessary computer equipment — from the CRT to the modem — space can be a problem. One solution is the B.T. Space Saver Printer Stand, which allows continuous form paper to be stored under the printer, allowing for easy stacking of completed forms behind the printer.

The stand is constructed in clear plexiglass and is available in many configurations, including regular, for 80 column type printers and large, for 132 column printers.

Prices start at $29.95 and are available at most computer stores.

For information contact B.T. Enterprises, 10B Carlough Rd., Bohemia, NY 11716.

TYMSHARE SCANSET XL TERMINAL

A personal information station merging two devices — the telephone and computer terminal — into one unit has been introduced by Tymshare, Inc.

Priced at $895, the Scanset XL™ was developed to handle the communications needs, including voice transmission, easy access to computer-stored information and electronic mail, of non-computer professionals. The compact unit is in an an attractive, woodtone cabinet and fits unobtrusively in the office or home.

The Scanset line of terminals was designed expressly to access data, rather than input data like most terminals. Because it takes only the press of a key or two to operate, a Scanset enables even those unfamiliar with terminals to access computer-stored information easily.

With built-in modem, automatic dialer and automatic computer log-in, the XL lets users phone and log-in to their own company computers or to commercial data bases.

When the Scanset is turned on, a directory is automatically displayed on the terminal's screen. The directory consists of up to 36 phone numbers stored in the unit's memory. By pressing the one or two keys listed in the directory for each number, the terminal is automatically connected to a company's computer or a commercial data base, or the phone dials a frequently called number. The first four numbers of the directory also can be used to automatically perform the log-in process required to tap into a computer. The six keys which perform these multiple functions can be programmed easily, either by the user from the keyboard or remotely from the computer.

Although the XL has the same basic abilities as larger, more expensive terminals for communicating with computers, and can replace a user's ordinary telephone, it only takes slightly more than one square foot of space and weighs about 15 pounds.

Other features include a P4 phosphor, nine inch diagonal screen with a flicker-free display and a 69-key standard layout keyboard with four cursor control keys. The screen holds 24 lines of text with the flexibility of 40 or 80 character line lengths. The Scanset XL also has limited graphics capability, including forms and simple line or bar graphs.

For information contact Tymshare, 20705 Valley Green Dr., Cupertino, CA 95014.

EDUPRO EDUCATIONAL PROGRAMS

The first educational software programs that allow for group participation have been introduced by Edupro.

The Microgroup™ educational programs allow up to eight students to share a single microcomputer while developing skills in mathematics, language arts, science and social studies. This first generation of hands-on software is designed for home instruction and elementary, junior high and high school use.

Microgroup-4 programs allow four players, using joysticks, to move their numbered cursors around the screen's "playfield" simultaneously. They spell words, decipher phrases, solve math problems or draw pictures together; the programs can be used competitively or cooperatively.

Microgroup-8 programs use paddles to control scrolling and selection of responses. All are age-graded in difficulty.

The 52 different programs operate on Atari 400/800 computers with at least 16K memory.

For information contact Edupro, P.O. Box 51346, Palo Alto, CA 94303.

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If you have hardware, software or services to offer TODAY's 60,000 plus readers, let them know with a low cost Shopper's Guide listing.

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Industry Watch

MAGNOLIA MICROSYSTEMS INTERFACE ADAPTER

An RS232 interface adapter for the Zenith ZT1 personal information terminal is now available from Magnolia Microsystems.

The ZT1 terminal contains an integral 300 baud modem for communicating with computers over telephone lines, and this new interface allows it to communicate with computers at the user's site.

Retail price for the unit is $69.

For information contact Magnolia Microsystems, Inc., 2264-15th Ave. W., Seattle, WA 98119.

COMING IN THE APRIL ISSUE OF TODAY

Videotex in American Agriculture

Farmers were the pioneers of videotex—a technology that is changing the core of American Agriculture.

Basic Computer Care

Find out about the potential hazards that await recreational, business and professional microcomputer users along with some common sense preventative maintenance procedures that can help you avoid these problems.

Getting the Most Out of VisiCalc

The VisiCalc manual is only the beginning of the wonderful world of VisiCalc. Learn some tricks that will help you stretch this versatile program even further.

NOVATION J-CAT MODEM

Connecting with your computer has become more innovative with several technological advances Novation has made with the modem.

The J-CAT is a new 300 baud, direct connect, auto answer/originate modem that is approximately one-fifth the size of conventional modems. It uses LSI technology to pack a long list of features into its compact size, which allows it to be placed virtually anywhere. It plugs into any modular RJ11C phone jack.

Carrying a suggested retail price of $149, the J-CAT has been engineered so that it automatically switches into the right mode (answer or originate). LED's show you stats, and audio "beeps" tell you when you reach a busy signal, detect a carrier or get a dial tone. Other features include a disconnect/test key, connect/break key, self-test, low power and compatibility with EIA-RS232C.

In addition, Novation has introduced a 103 and 103/212 smart modem using LSI technology to run cooler and more efficiently.

Called the SMART-CAT™ modems, the new units offer a maximum of features in a minimum of space. The 103 SMART-CAT is 300 baud, full duplex while the 103/212 SMART-CAT operates at 300 or 1200 baud, full duplex. Suggested retail price for the 103 SMART-CAT is $249 and for the 103/212 model $595.

Features that Novation has incorporated into the smart modems include a built-in dialer (TouchTone or rotary), auto answer, direct connect, analog and digital loopback testing and an extensive software command set. The units also have a busy detect capability that allows the modem to be programmed to redial.

For information on these modem contact Novation, 18664 Oxnard St., Tarzana, CA 91356.

THE SUNBURST

The SunBurst, a new entry-level microcomputer, is now available from Sunset MicroSystems, Inc.

The compact SunBurst retails for $7,500 and can outperform many other larger microcomputers.

It employs a 6 MHz Z80B processor with 256K bytes of 150-Nanosecond RAM, 20 MN 5¼" Winchester disk, 1 MB 5¼" floppy disk, 10 serial ports and 1 parallel port.

For information contact Sunset MicroSystems, Dept. 102, 3555 Lomita Blvd., Torrance, CA 90505.

INFOTORY AVAILABLE FOR HARD DISK

INFOTORY, an inventory management system for the IBM Personal Computer, is available for the hard disk drive from S.S.R. Corp.

The powerful menu-driven system contains many unique features, including the sales and cost of sales information summarized by departments, product lines or any other category. In addition, price lists and sales/cost analysis reports can be scrolled on the video monitor or printed in report format. The hard disk will accommodate 25,000 inventory items.

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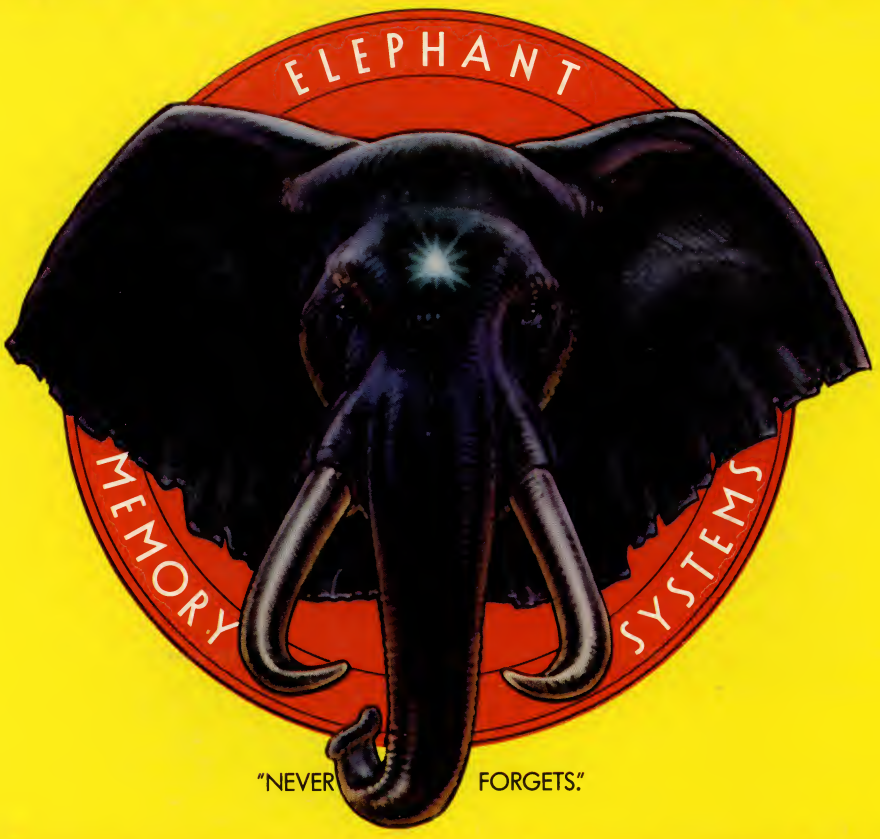

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